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SHELLFISH GROWING WATER BACTERIOLOGICAL AND SANITARY SURVEY OF SOOKE HARBOUR AND BASIN, BRITISH COLUMBIA, 1983

Regional Program Report No. 84-24

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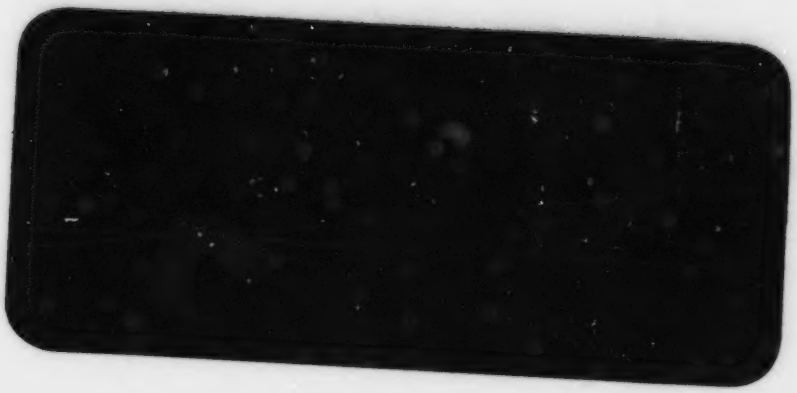

ENVIRONMENT CANADA
CONSERVATION AND PROTECTION
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PACIFIC AND YUKON REGION

SHELLFISH GROWING WATER BACTERIOLOGICAL AND SANITARY SURVEY OF SOOKE HARBOUR AND BASIN, BRITISH COLUMBIA, 1983

Regional Program Report No. 84-24

By

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ABSTRACT

Bacteriological and sanitary surveys of Sooke Harbour and Basin were conducted in 1983 during two different climatic conditions. The purpose of these surveys was to re-evaluate the quality of the shellfish growing waters and to identify and evaluate sources of fecal pollution to these marine waters.

During the summer period, August 9 to 14, 1983 and the winter period, December 6 to 12, 1983, a total of 598 marine, 111 freshwater, 11 tissue, and 8 sediment samples were collected. Eight of the sixty marine stations sampled did not meet the approved growing water quality standards.

Data indicate that fecal contamination is sporadic in all stations of the study area but most evident around the areas of Sooke Flats, Hutchinson Cove and Anderson Cove. This contamination was also more evident during the winter period coincident with increased precipitation, lower amounts of sunlight, cooler temperatures and increased freshwater input.

As a result of this study one closure has been expanded, one closure has been renamed, and six closures have been revoked under the Pacific Shellfish Regulations Schedule I (Contaminated Areas).

RÉSUMÉ

Des études bactériologiques et sanitaires du port et du bassin de Sooke furent conduites en 1983 sous deux conditions climatiques différentes. Le but de ces études était de réévaluer la qualité des eaux fréquentées par les mollusques et crustacés ainsi que d'évaluer les sources de pollution fécale se déversant dans ces eaux marines.

Pendant la période d'été du 9 au 14 août, 1983 et la période d'hiver du 6 au 12 décembre, 1983, un total de 598 échantillons marins, 111 d'eau fraîche, 11 de tissue et 8 de sédiment furent collectés. Huit des soixante stations marines échantillonnées n'ont pas satisfait les standards de qualité approvés pour les eaux de culture.

Les données indiquent que la contamination fécale est sporadique pour toutes les stations de la région étudiée mais plus évidemment près des régions de Sooke Flats, Hutchinson Cove et Anderson Cove. Cette contamination était aussi plus évidente pendant la période d'hiver coincidant avec une augmentation de précipitation, une diminution de lumière solaire, de plus basses températures et un apport accru d'eau fraîche.

A la suite de cette étude, une fermeture a été élargie, une fermeture a été renommée, et six fermetures furent annulées sous le règlement de pêche des mollusques et crustacés du Pacifique Annexe 1 (Secteurs contaminés).

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LIST OF ABBREVIATIONS

C.R.D.	Capital Regional District
FC	Fecal Coliform
FS	Fecal Sreptococci
>	Greater than
<	Less than
g	gram
km	kilometer
m	meters
ml	milliliters
mm	millimeters
MF	Membrane Filtration
MPN	Most Probable Number
$^{0}/_{00}$	Parts Per Thousand
PE	Population Equivalents
SPC	Standard Plate Count
STN	Station

CONCLUSIONS

1. Harrison Point and waters north of this area continue to show sporadic contamination. The previous shellfish survey (Arney and Gaertner, 1975) indicated four possible sources of contamination related to either agricultural or residential sources. This survey found the same general causes of contamination still exist but the specific sources have changed and would require further intensive investigation to determine their exact nature.

2. Portions of the overlying waters of Sooke Harbour and Basin show increased fecal coliform contamination during the winter or heavy rainfall months. A combination of increased river bacterial densities, increased river flows, and physical oceanographic characteristics of Sooke Inlet disperse bacteria over the area of Sooke Flats, Billings Spit, and the Billings Point - East Sooke Basin area.

3. Marine waters in the vicinity of Lannon Creek are contaminated by pasture land drainage to this creek.

4. The headwaters of Hutchinson Cove are most probably contaminated by Vietch Creek. A more thorough sanitary survey of the Vietch Creek watershed and foreshore of Hutchinson Cove is recommended.

5. The marine waters around the Grouse Nest Resort are of acceptable bacteriological quality. The resort is presently not in use but does have a resident manager and caretaker. The manager's residence is serviced by a septic tank and tile field disposal system. Direct discharges still exist from three buildings and should be removed. It is recommended the existing closure be lifted while the resort is not being used.

6. The southeast corner of Sooke Basin, Closure 20-4, shows the marine waters to be of acceptable bacteriological quality for the purposes of shellfish harvesting. Although sewage pollution sources identified during 1975 still exist, it is recommended the closure be revoked due to the absence of shellfish resource.

7. The source of contamination as documented by the 1975 survey in the area north and east of Anderson Cove (Closure 20-5) has been removed. It is recommended the closure be revoked.

8. Although the present survey data was within acceptable limits, the southeast corner of Anderson Cove continues to show evidence of fecal contamination. This in combination with information from past surveys indicates a source of contamination that is variable and undefinable. It is recommended the closure (Closure 20-6) be retained.

9. The tidal foreshore waters east of Hill Head (Closure 20-7) are of acceptable bacteriological quality for shellfish harvesting. Due to the absence of any identified sewage discharge and the absence of a shellfish resource, it is recommended the closure be revoked.

10. The waters of east Sooke from Eliza Point to Hill Head are contaminated during the wet season by the Sooke River and rain-induced landwash. This area should be included in an expanded closure.

11. The waters and tidal foreshore of Sooke Inlet lying in the vicinity of closure 20-8 are of acceptable bacteriological quality for the harvesting of shellfish. Due to the absence of any identified sewage discharge and the absence of a shellfish resource, it is recommended the closure be revoked.

SCHEDULE I CLOSURES

As a result of the studies described herein, the following additions and deletions to Schedule I of the Pacific Shellfish Regulations have been recommended by the Pacific Standing Committee on Shellfish.

1. Area 20-1. The waters and tidal foreshore of Sooke Harbour and Sooke Basin, Area 20, lying inside, that is northerly of, a line drawn from Harrison Point to Eliza Point, thence along the shoreline from Eliza Point to Hill Head, and thence from Hill Head to the most southerly point of land between Cooper Cove and Hutchinson Cove.

2. Area 20-2. REVOKE - See Area 20-1.

3. Area 20-3. REVOKE

4. Area 20-4. REVOKE

5. Area 20-5. REVOKE

6. Area 20-6. The waters and tidal foreshore of Anderson Cove, Sooke Basin, lying within a 60 m radius of the most northerly point of land in the southeast corner of Anderson Cove.

7. Area 20-7. REVOKE

8. Area 20-8. REVOKE

It is recommended that Hutchinson Cove remain under a Fisheries Public Notice Closure until further sanitary investigations are made in this area. Shellfish closures are illustrated in Figure 1.

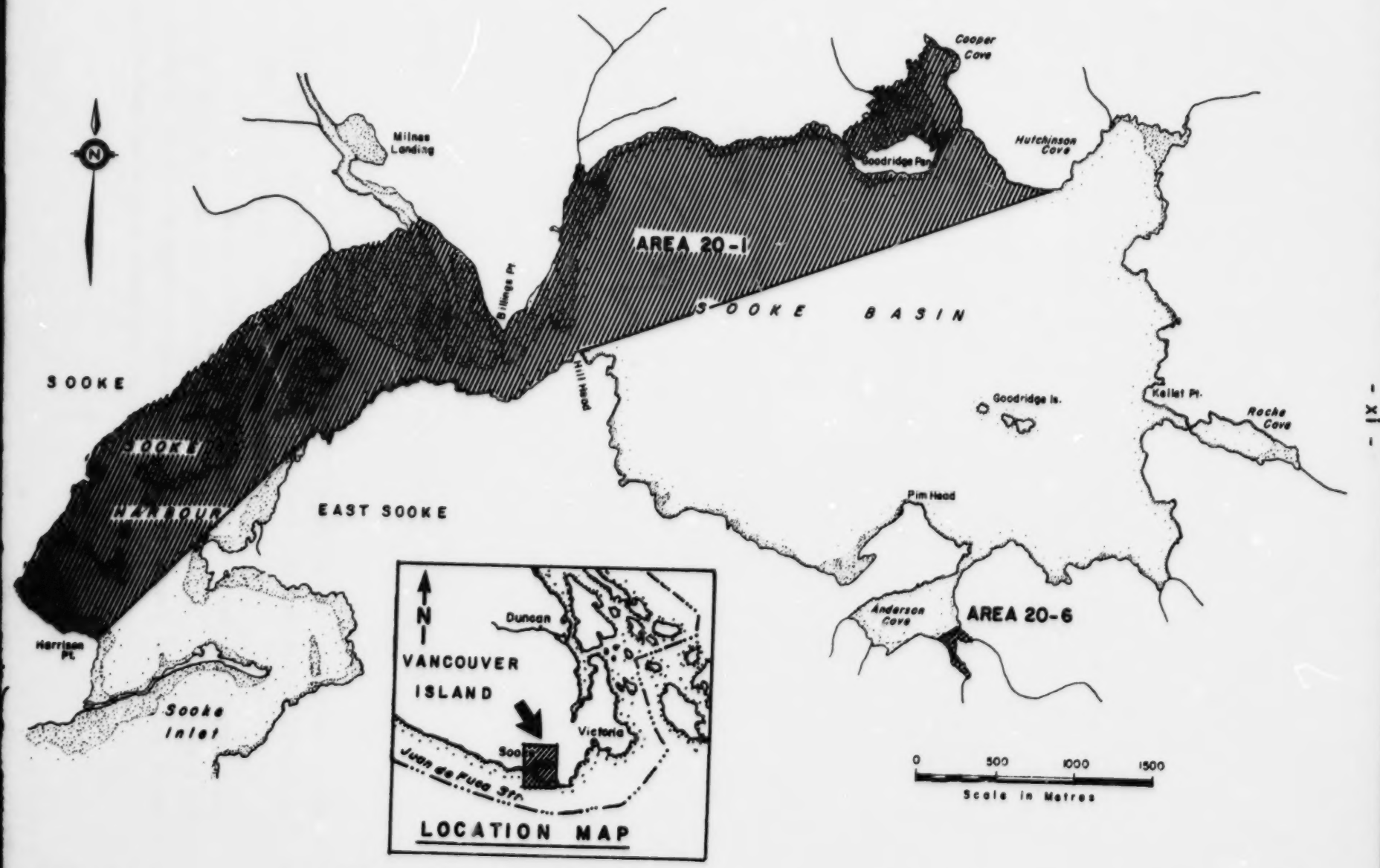

FIGURE 1 PROPOSED SCHEDULE I CLOSURES - SOOKE HARBOUR AND BASIN

1 INTRODUCTION

Sooke Inlet is located on the south coast of Vancouver Island 34 kilometers southwest of Victoria. The inlet features three main divisions including an outer portion of the inlet bordering and open to Juan de Fuca Strait, an inner harbour 3 km long between Whiffin Spit and Billings Spit and an inner deeper basin again roughly 3 km in length.

The mean depth of the basin is 17 m while the mean depth of the harbour is 3 m. However, as shown in Figure 2, depths in the harbour can exceed 17 m while those in the basin can exceed 30 m.

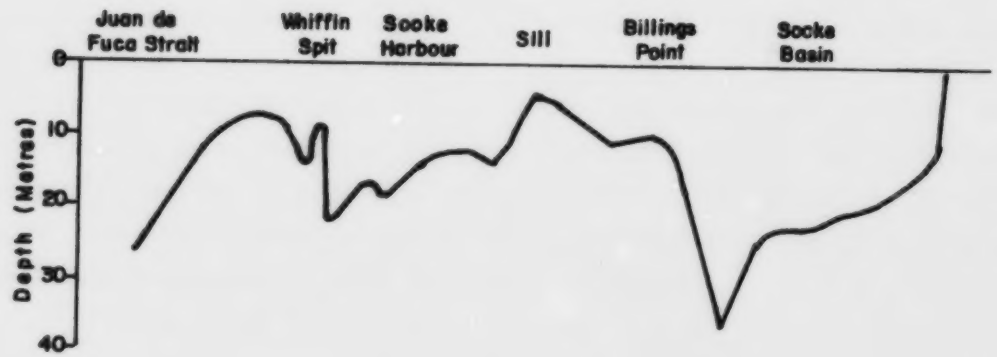

FIGURE 2. BATHYMETRIC PROFILE - SOOKE INLET (Elliott, 1969)

The characteristics of Sooke Inlet waters are determined by the varying degrees of influence of the tidal exchange of Juan de Fuca Strait and the input of freshwater from the Sooke River.

Tides in Sooke Inlet are considered to be mixed and predominantly diurnal with one low and one high during a lunar cycle. Tidal waters are considered to be the main influence on the Inlet waters during the summer period when Sooke River flows are low.

When river water flows increase usually between October and March, the input of freshwater has the effect of lowering salinity values hence the density of water in the harbour. This in turn sets up a different exchange rate for the inner basin which becomes important when looking at differences in bacterial densities between winter and summer survey periods.

Sooke Inlet was last fully surveyed by the Environmental Protection Service in 1975 and partially resurveyed in 1981 (Arney and Gaertner, 1975; Shepherd, 1981). The 1975 survey was undertaken to assess the effects of several changes in foreshore and upland development and to determine the cause(s) of contaminated shellstock samples harvested from growing areas within the inlet. As a result of the 1975 survey, 8 additional closures were added to the Pacific Shellfish Regulations Schedule I (Contaminated Areas).

In 1981 a sanitary survey was conducted at the request of the Pacific Shellfish Standing Committee. This survey was to reassess problems identified in the earlier survey and to evaluate new development and its potential impact on the existing shellfish producing areas (Figure 3).

The 1983 shellfish growing water sanitary survey described herein was conducted as a requirement of the Canadian Shellfish Safety Program to completely resurvey an area once every ten years. Additionally, the purpose was to re-evaluate those closures which resulted from the 1975 survey and investigate recommendations of the 1981 reappraisal.

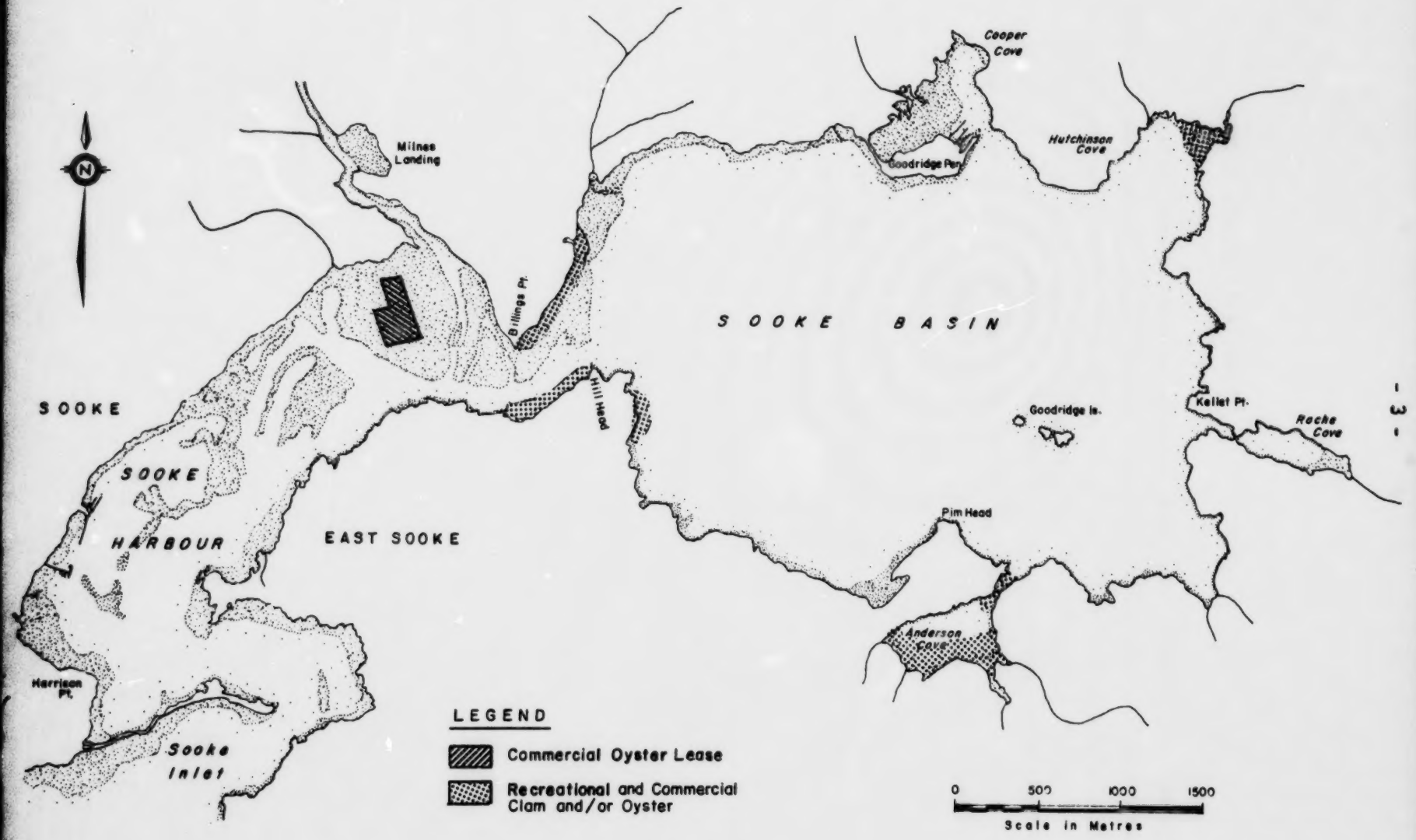

FIGURE 3 SOOKE HARBOUR AND SOOKE BASIN- SHELLFISH LOCATIONS

2 SAMPLE STATION LOCATIONS

Marine sample station locations and numbers varied considerably between summer and winter as shown in Figures 4 and 5. Several factors must be considered when designing a molluscan shellfish growing water survey in order to properly classify the growing waters. In this case a larger number of samples during the winter was necessary in order to deal with the high variable rainfall conditions and resultant high runoff to marine waters.

With this increase in rainfall it also became necessary to sample a larger number of freshwater stations (Figures 4 and 5). Freshwater station descriptions are presented in Appendix II.

Shellstock and sediment samples were also collected. Results are presented in Appendix VI.

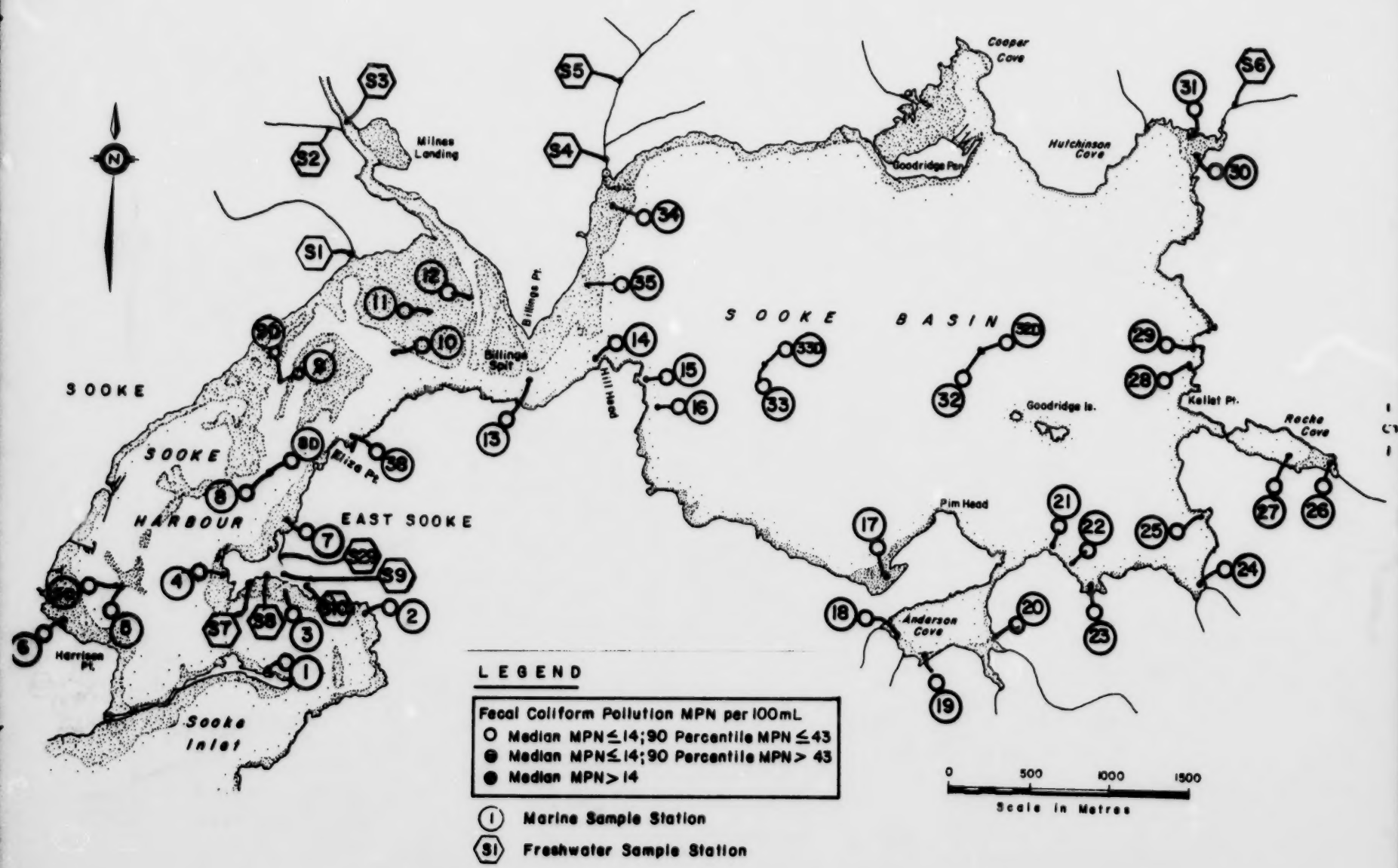

FIGURE 4 MARINE AND FRESHWATER SAMPLE STATION LOCATIONS - August 1983 - SOOKE INLET

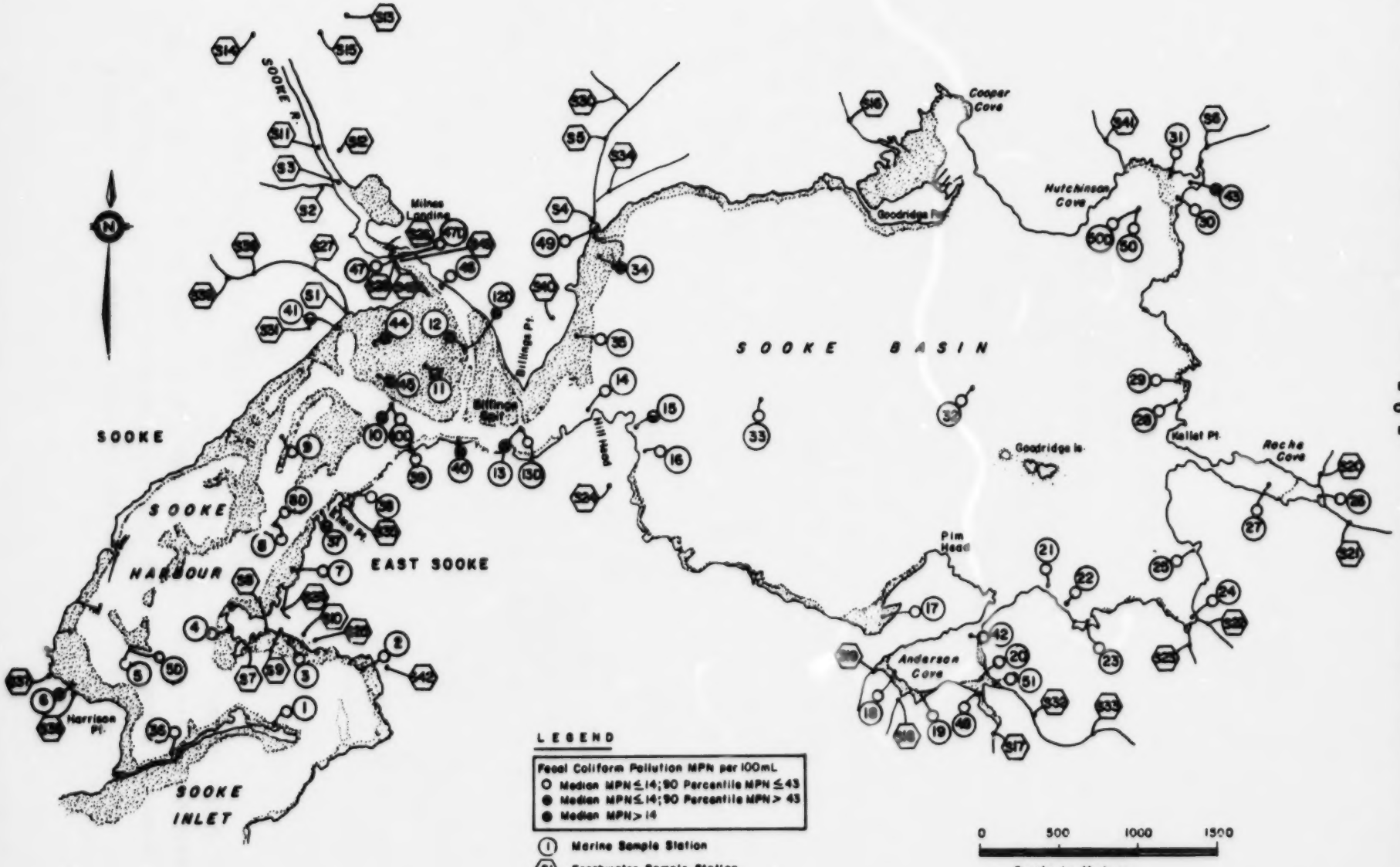

FIGURE 5 MARINE AND FRESHWATER SAMPLE STATION LOCATIONS - December 1983, SOOKE INLET

3 FIELD PROCEDURES AND METHODS

3.1 Bacteriological Sampling and Analyses

All marine surface water samples for bacteriological analyses were collected in sterile wide-mouth glass bottles, approximately 15-30 cm below the water surface. Samples were stored in coolers at temperatures not exceeding 10°C until processed. Analyses were carried out within five hours of collection in the mobile Environmental Protection Service microbiology laboratory located in the Sooke area.

The fecal coliform most probable number (MPN) per 100 mL was determined using the multiple tube fermentation technique (at least three decimal dilutions of five tubes each) as described in Part 908 of the 15th edition of Standard Methods for the Examination of Water and Wastewater. The culture medium used was the A-1 medium as described by Andrews and Presnell (1972). An evaluation of the A-1 medium in the Pacific Region has been done by Kay (1978) and the reader is referred to this paper for further information.

All freshwater samples were collected in sterile wide mouth glass bottles and were tested for fecal coliform and fecal streptococci, using the membrane filtration (MF) method described in Part 909 and 910 of the 15th edition of Standard Methods. Media used were m-FC and KF streptococcus agars obtained from Difco laboratories, Detroit, Michigan, USA, for the fecal coliform and fecal streptococci tests respectively. The membrane filters used were Millipore HA, obtained from Millipore Limited, Mississauga, Ontario.

Biochemical confirmation of fecal coliform isolates obtained from the MPN procedure was performed on a percentage of all samples collected. These results are presented in Appendix VII.

3.2 Physical Testing Analyses and Equipment

Salinity measurements were made on all marine samples using an American Optical Refractometer (Catalogue No. 10413) which has a resolution to the nearest 0.5 part per thousand. Salinity data is presented in Appendix I. Rainfall data were obtained from the Atmospheric Environment Service.

4 RESULTS AND DISCUSSION

Canadian bivalve molluscan shellfish growing waters are classified according to the following criterion:

> In order that an area be considered bacteriologically safe for the harvesting of shellfish, the fecal coliform median MPN of the water must not exceed 14 per 100 ml, and not more than 10% of the samples ordinarily exceed an MPN of 43 per 100 ml for a 5 tube decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most unfavourable hydrographic and pollution conditions.*

Accordingly, using the combined data for both study periods, 8 of the 60 stations statistically analyzed did not meet the criteria necessary for the bacteriologically safe harvesting of shellfish (Appendix IV).

4.1 Sooke Harbour

4.1.1 Whiffin Spit, Harrison Point. August, December, and combined data for stations 2, 3, 4, and 36 are presented in the following table.

TABLE 1 MPN DATA STATIONS 2, 3, 4, 36

STATION	AUGUST		DECEMBER		COMBINED	
	Median	90th	Median	90th	Median	90th
2	< 2	23	5.	24.4	< 2	26
3	2	7.4	6.5	17.6	2	10.5
4	< 2	3.6	-	-	< 2	6.5
36	4 samples Range 5 - 33					

*This report expresses the 10 percent limit in terms of a 90 percentile which must not exceed 43 per 100 ml

Data for all stations met the approved growing water standard for both August and December sampling events. Marine stations 2 and 3 continue to show evidence of low level contamination particularly during an ebbing tide. Upland sanitary investigation of the area did not show any specific source for the bacterial densities in the marine waters. Marine sediments sampled in the vicinity of station 2 recorded fecal coliform levels of < 20 and 110 MPN/100 g.

The previous study in 1975 identified a single family residence with an exposed tile field that may have been a cause of contamination. Subsequent investigation by the Health Unit showed this was not the case. The marine station sampled during that survey had a median MPN of 13 FC/100 ml and a 90th percentile of 88 FC/100 ml.

Sanitary investigations did reveal a lamb farm in the area of Tideview road that could be a potential source of contamination. Surface water runoff from the grazing area is presently being re-directed via drainage ditch to a small cove north of Christie Point. Freshwater station 29 had counts of 670 FC/100 ml and 120 FC/100 ml. The ditch was flowing during December but dry during August.

Well water samples from 5 sites along the foreshore below the pasture area of the farm were sampled for bacteriological analyses. Results of these samples are presented in Table 2.

TABLE 2 MPN DATA WELL WATER SAMPLES

SAMPLE STATION	AUGUST		DECEMBER	
	FC/100 ml	FS/100 ml	FC/100 ml	FS/100 ml
7	0	103	0	-
8	1	2		
9	0	100		
10	3	392		
25			$\bar{x}$ = 5	$\bar{x}$ = < 10

Fecal coliform levels are low but fecal streptococci are present in 3 of the 6 samples analyzed. Sample station 10 would appear to be directly in line with the movement of groundwater from the animal grazing area. The isolation of FS from well waters would seem to indicate the possibility of contamination of these by drainage from the farm. Further isolates were not performed on these samples hence the specific source could not be identified. A more detailed study would be required to positively identify the source and degree of contamination. The home at station 10 is a summer residence and the well water is not used for consumption. Sample station 36 was collected during December only and three of the four samples collected showed elevated counts. Sanitary investigation of this area did not identify a source of contamination but data shows generally higher counts with lower salinities.

4.1.2 Harrison Point North.

TABLE 3 MPN DATA HARRISON POINT

MARINE STATION	AUGUST		DECEMBER		COMBINED	
	Median	90th	Median	90th	Median	90th
5	< 2	2	2	17	< 2	14.2
6	2	7.7	17	107	5	21.8

Combined data as presented in Table 3 shows both stations met the shellfish growing water standard. Counts were higher for both stations during December, with station 6 exceeding the median standard.

Regression analysis (Log MPN vs daily rainfall + 24 hr antecendent rainfall) did not show significant correlation. Log MPN vs salinity regression analysis suggest an inverse relationship ($r = -0.73$), i.e., as salinity decreases MPN counts increase. Freshwater stations 36 and 37, sampled once during the December survey, had counts of 140 FC/100 ml and 510 FC/100 ml respectively. Marine station 6 for the same day had a count of 220 FC/100 ml.

Upstream investigation of these watersheds led to several potential sources of contamination. The drainage area for these creeks is characterized by three development designations including Village Residential, Agricultural, and Community Residential (Capital Regional District, 1983).

Creek waters through agricultural areas may be contaminated by agricultural wastes from small hobby farms where animals such as cows, ducks, chickens, and geese have direct access to the creek waters, or fecal matter is transported from pen stocks to the creek waters by landwash.

Residential developments through the creek drainage area have had subsurface soil absorption system failures which have contaminated creek waters (pers. comm. J. Davis, Public Health Inspector, Capital Regional District). Among the many reasons for such failures is field washout caused by a high water table. Sooke area has a 30 year adjusted rainfall average of 1287 mm annually. Rainfall occurs on the average 169 days of the year. The most predominant method for sewage disposal in this area is the septic tank soil absorption system. A high water table during the wet season may cause saturation of the soil absorption system, which is ultimately washed to the nearest water course (pers. comm. J. Davis, Public Health Inspector, Capital Regional District).

A second cause for failure of these systems is lack of maintenance. Public health services have documented cases of soil absorption system failures due to solids being carried over to the tile field because the septic tank has not been pumped out regularly (pers. comm. J. Davis, Public Health Inspector, Capital Regional District).

4.1.3 East Sooke. Stations 37 and 38 were sampled during the December survey only. Station 37 exceeded the growing water standard with a 90th percentile of 81.8 FC/100 ml. Station 38 did not exceed the allowable limit but showed some contamination with a median of 13 FC/100 ml and 90th percentile of 26.6 FC/100 ml. Station 7 was sampled during August and December and was of acceptable bacteriological quality.

The most probable cause for contamination of these stations is a combination of the Sooke River and localized impact from small streams.

Regression analysis for log MPN vs salinity for stations 37 and 38 shows a trend for increasing coliform counts with decreasing salinities ($r = -0.7$).

Freshwater station 35, which enters a small cove at marine station 38, had counts of 540 and 210 FC/100 ml, and would most likely be contributing to the contamination of this area. This stream flows through a small lamb farm that also supports a variety of other animals. The animals have direct access to the stream and drainage from the pasture area also washes to the creek.

Shellstock samples collected in the vicinity of station 38 had FC levels of 110/100 g and 3500/100 g. Sediment samples from the same area had FC values of 50/100 g and 2200/100 g. These samples were collected during the August survey. No rainfall occurred during this survey and FC values for the Sooke River were low. Freshwater station 35 was dry during August.

4.1.4 Sooke Flats, Eliza Point to Hill Head, Billings Spit. The bacteriological quality of the waters in the area of Sooke Flats, and Eliza Point to Billings Spit are largely a result of the influence of the Sooke River. A number of smaller sources also exert a localized impact on water quality. The degree to which the Sooke River influences water quality of the area in general is dependent on a number of conditions including the hydrologic year, tides and currents, and bacterial survival. This will be discussed in greater detail in following sections.

Bacterial contamination of the study area is related to rainfall and data show there is a considerable difference between the dry August survey and the wet December survey.

The daily data records and summaries for the marine stations are presented in Appendix I and IV respectively (Stations 10, 10D, 11, 12, 12D, 13, 13D, 39, 40, 41, 44, 45, 46, 47, and 47D).

All stations met the approved growing water criteria during the August survey period. Marine station 12, located in the plume of the Sooke River recorded the highest fecal coliform count of 33/100 ml coincident with the lowest salinity (28 ppt). The mean salinity for station 12 during August was 30.0 ppt while stations further out from the mouth (Stations 10, 11, and 13) each recorded mean salinities of 31 ppt. These high surface salinity

values reflect waters of Juan de Fuca Strait and indicate there is very little influence from the Sooke River.

The mean fecal coliform count of the Sooke River during the August survey was 36/100 ml with a mean discharge rate of 0.728 m^3/s and population equivalent less than one. Population equivalents are a means of quantifying the daily fecal coliform loading by the river in terms of per capita population. The calculation assumes that the average person sheds 3.2×10^{10} fecal coliform organisms per day. The equation for this is represented by;

$$\text{Population Equivalents} = \frac{\text{Fecal coliform discharged/day}}{\text{Fecal coliform/person/day}}$$

$$\text{P.E.} = \frac{\text{Flow x fecal coliform concentration}}{3.2 \times 10^{10}}$$

Popluation equivalents for the DeMamiel Creek (S2) tributary to the Sooke River were also less than one for three days of sampling (Mean FC = 36/100 ml).

Shellstock samples were taken from the oyster lease in the vicinity of station 11. Mixed clams sampled on August 9 produced a count of 110 FC/100 g while butter clams sampled on August 11 exceeded the wholesale market guideline of 230 FC/100 g, indicating there is a source of contamination although it was not evident in the overlying waters during the survey period. A single sediment sampled on August 9 yielded a count of < 20 FC/100 g.

During the December survey all stations with the exception of stations 10D, 13D, and 39 exceeded the shellfish growing water quality standard (Table 4).

Generally, as salinities decreased fecal coliform densities increased. Log MPN correlated negatively with salinity values ($r = -0.83$). Surface samples were taken from the upper meter of water and reflected increased bacterial densities in the harbour stations due to a greater percentage of Sooke River water diluting the incomining strait waters.

TABLE 4 MPN - SALINITY DATA DURING HIGH RUNOFF, December 6-12, 1983

STATION	MEDIAN FC/100 ml	90th PERCENTILE FC/100 ml	MEAN SALINITY $^{0}/_{00}$
10	14	79.1	21.0
10 Depth	< 2	4.5	28.0
11	8	95.1	21.0
12	17	48.4	10.5
12 Depth	17	28.0	22.0
13	23	31.2	16.5
13 Depth	< 2	3.0	29.5
39	9	39.4	20.0
40	17	26.0	17.0
41	13	58.0	21.5
44	15	44.8	21.5
45	18	57.4	19.5
46			
47	insufficient samples to calculate median and 90th percentile		
47 Depth			

Sooke River flows were not recorded during the December survey because the river stage was too high to guage by wading. The city of Victoria keeps records of the regulated flows out of Sooke Lake (Table 5). Although the flows do not necessarily reflect the same values at the mouth, they are relevant for comparison between months and show discharge values for the month of December are 175 times those in August (Water Survey of Canada, 1983).

Sooke River sample stations S3 and S11 did not show significant fecal contamination (Mean FC = 13/100 ml) and compared favorably with the upstream station (S14) mean FC = 10/100 ml. However, station S28 on the west bank of the river below the DeMamiel Creek confluence had a mean fecal coliform level of 56/100 ml indicating this creek is a source of contamination.

DeMamiel Creek (S2) originates at Young Lake, flows through west Sooke, and enters the Sooke River just above the Sooke River bridge. The draft settlement plan designates a greenstrip whenever possible along the

entire length of the creek to maintain the natural state and to protect the creek from activities associated with development. The watershed is presently identified as open space (Capital Regional District, 1983).

TABLE 5 MONTHLY MEAN SOOKE RIVER DISCHARGE VALUES, 1916-1966

MONTH	MEAN DISCHARGE Cubic meters/sec.
January	6.38
February	5.34
March	3.92
April	2.15
May	.661
June	.067
July	.032
August	.034
September	.041
October	.367
November	2.25
December	5.97

DeMamiel Creek has a smaller cross section than the Sooke River, but again high flows in the creek were impossible to guage by wading so population equivalents could not be calculated. Nevertheless, the impact of this creek on the Sooke River was clearly demonstrated, an example being December 8, when the creek recorded an estimated value of 733 FC/100 ml and the downstream Sooke river station (S28) recorded a same-day value of 92 FC/100 ml. This high FC level was recorded following a significant rainfall on the previous day (27.4 mm, Table 6).

A sanitary investigation of the lower portions of the creek did not identify any point sources of contamination, suggesting that contamination may be due to landwash (first flush) effects of a storm.

TABLE 6 PRECIPITATION DATA FOR THE SAMPLING PERIOD

DATE December 1983	PRECIPITATION mm/24 hours	DATE December 1983	PRECPITATION mm/24 hours
1	-	7	27.4
2	2.5	8	2.9
3	-	9	7.9
4	0.9	10	5.0
5	0.5	11	0.4
6	-	12	19.9

Another potential source of contamination to the river exists in the area of Baker Creek (S12). This creek drains small pockets of agricultural and residential areas along the NE shores of the river opposite station 11. Baker Creek is small and would not appear to be a significant source of contamination to the river, but the area around the mouth of Baker Creek is presently used as pasture land for a small number of horses and cows. On a high tide roughly one-third of the pasture area is flooded. Animal fecal matter deposited on a low tide or washed off the adjacent pasture area could have some effect on the downstream bacteriological water quality.

Closer to the mouth, glass washing water from the Sooke River Hotel is discharged through a pipe that extends out from the river bank. A sample of this discharge during August produced a value of 30 FC/100 ml (S43). Domestic waste from the pub, restaurant, and living quarters is treated in a 2.7 m^3 septic tank and disposed of to one of two sub-surface tile fields. The fields are alternated on a monthly basis which introduces the concept of "resting". Resting a field allows a period of time between use for chemical and biological decomposition of organic matter and compounds that have been filtered out of the wastewater. This has the potential for adding extra years of useful life to a subsurface disposal system because the chances of clogging the porous soil interface along the distribution pipes are substantially reduced. This system was installed in 1981 and was operating satisfactorily during the study.

Sooke Flats at the mouth of the Sooke River is bordered on the east side by Billings Spit that extends out to Billings Point. The area is characterized by a mix of single and multiple residential dwellings with some light industry on the east side of the spit. Septic tank and tile field are the predominant means of sewage treatment and disposal. The soil in the area is classified as "gravelly, sandy loam that drains rapidly" (Day et al, 1959). During the wet season (October to March) the increase in rainfall produces a higher water table and for this area a greater likelihood of tile field washout or surfacing effluent. Contaminated surface water or groundwater ultimately will reach nearby marine waters.

One example of surface water contamination was noted at the apartment block "Glenidle By the Sea". Stormwater samples taken from the culvert that drains the east side of the apartment block and discharges to the shoreline produced counts of 200 and 410 FC/100 ml. The cause of these high counts was not determined but the source is suspected to have originated from the nearby subsurface disposal field.

Figure 6 illustrates the effect that the stormwater discharge and other sources of contamination coming from the east shore would have on the area of Sooke flats. Rhodamine dye was injected into the storm sewers of the apartment on December 9, 1984 during a flood tide. The movement of this dye spans a time frame of two hours from flood tide through to high slack. Dye moved south along the eastern shore to Billings Point. The plume then broadened out and appeared to move slowly east toward the Basin. During slack waters the plume appeared to disperse in all directions.

On the west side of Sooke Flats, marine station 41 had a median fecal coliform value of 17/100 ml. This station is locally influenced by Belivista Creek (S1). Although the flow in the creek is small, the mean MPN was 697/100 ml. Belivista headwaters begin at higher elevations north and east of Sooke. As the creek flows through Sooke toward the harbour it picks up tributary drainage in the form of small ditches and landwash associated with rainfall. Counts in the upper portions of the creek at stations S38 and S39 were 600 and 970 FC/100 ml respectively. The headwaters of the creek drain agricultural areas that likely account for the high levels in the upper stations. Station S31 is a ditch which drains a residential area of Sooke

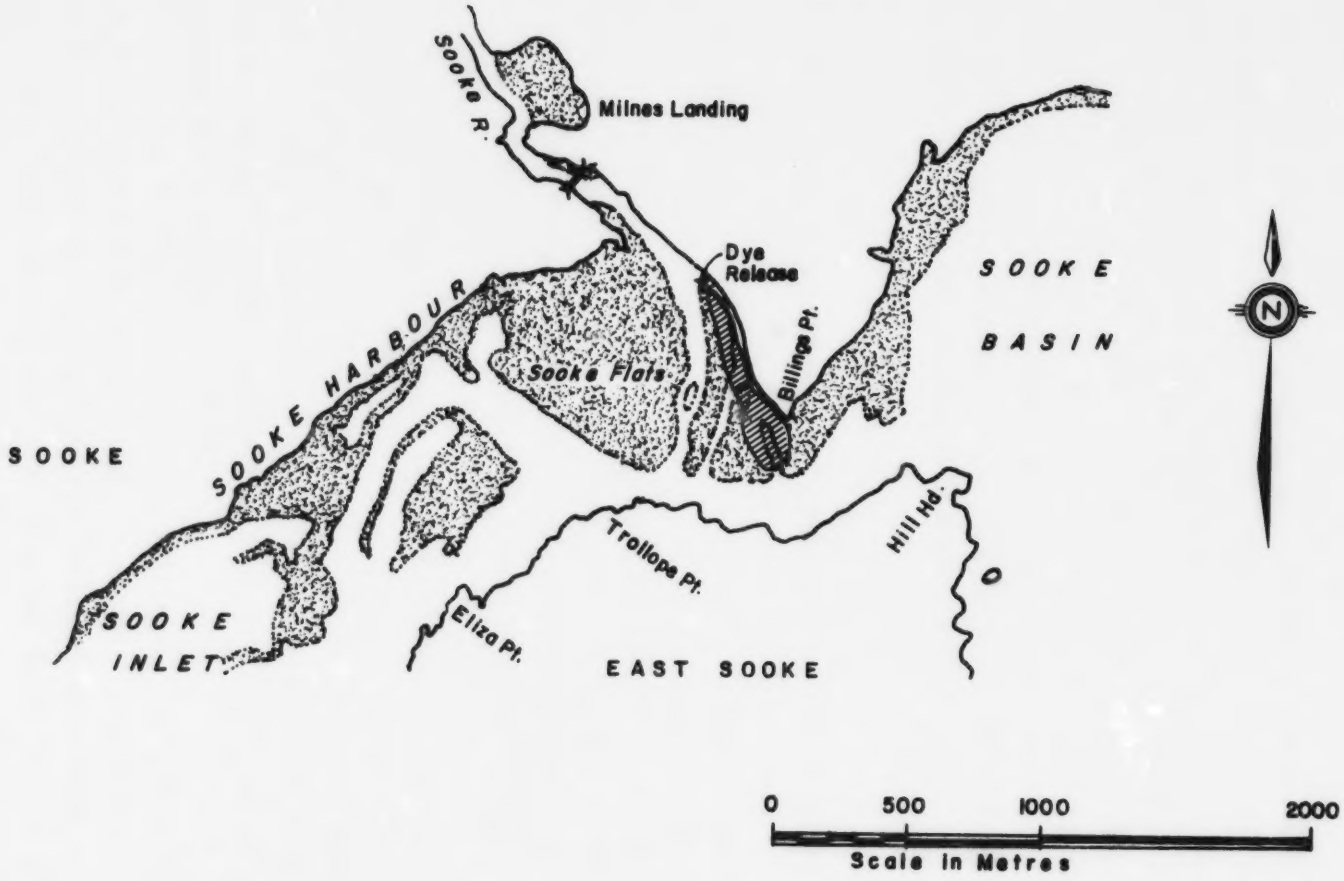

FIGURE 6 DYE TRACKING - SOOKE HARBOUR, December 10, 1983 FLOODING TIDE

and enters the creek closer to the mouth. A single sample taken from the ditch on December 9 produced a count of > 8000 FC/100 ml. Sanitary investigation at the time of the survey and again at a later date by the Capital Regional Health Services could not identify a specific source. The ditch is thought to be transporting wastes that have broken out of a residential subsurface disposal field. This is particularly evident during wet weather. Dye testing each individual home in the area would be required to identify the failing system. Since the date of this survey, Capital Regional Health Services has completed a more intensive study of individual disposal systems in the area.

4.1.4.1 Sooke River influence on water quality. Between April and September, river stage was low and the volume of river water entering the harbour was very quickly diluted by the waters of Juan de Fuca Strait. This was evidenced by fairly uniform salinity values over the entire area, with the exception of those directly in the mouth of the river. Salinity values were high ($\bar{x}$ = 30.4) approaching those of the strait waters. This effectively diluted the Sooke River bacterial densities (Mean FC = 36/100 ml) and resulted in marine waters being well below the shellfish growing water criteria (Median MPN = < 2).

By comparison, river stage was much higher between the months of October to March. Salinity values for all stations in the discussion area showed that the larger river flows were overlying the incoming strait waters because of the density difference. The increased river flow also created a more complex system of water movement within the basin and harbour that contributed to the spread of contamination.

During the high runoff period, Basin waters are exchanged 3.5 times per month as compared to 1.5 times per month in the low runoff season. The increased exchange rate results from an influx of more dense saline water from the harbour spilling over the sill into the Basin (Figure 2). Basin salinities decreased from the summer average of 31 ppt to the winter average of 20 ppt. In the winter approximately 50 to 70 percent of the tidal inflow to Sooke Basin is composed of river water (Elliot, 1969).

The result of this high water circulation pattern is to disperse bacteria associated with the Sooke River and other sources over the entire

area of Sooke Flats and Eliza Point to Hill Head. The net effect on water quality in terms of the difference between high and low water seasons is well illustrated in Figure 7. In addition, because of the clockwise gyre of water movement in the basin (Elliot, 1969) it is conceivable that bacteria could also be taken along the east side of Billings Spit, particularly on a flood tide.

It is also suspected that increased viability of the organism during the high water season or winter period added to the elevated levels seen in the area. Although fecal coliforms, specifically E. coli are not able to survive indefinitely in seawater, length of survival time is dependent on a number of factors. These include salinity, temperature, sunlight, microbial predation, and the presence of other biological bactericidal agents. Elevated water temperatures, typically 10°C-17°C during the summer months, high salinities, more sunlight and increased growth of predatory marine micro-flora contribute to the die-off rate of bacterial population. During the winter, conditions are more favorable to longer survival times because temperatures are lower, sunlight is decreased, salinities are decreased and growth conditions for predatory micro-flora are the least favorable (Bernard F.R., 1970; Sauage H.P. et al, 1971; Slanetz L.W. et al, 1965; Vasconcelos G.J. et al, 1976).

4.2 Sooke Basin

4.2.1 Sooke Basin West.

TABLE 7 MPN DATA STATIONS 34, 35, 49

STATION	AUGUST		DECEMBER		COMBINED	
	Median	90th	Median	90th	Median	90th
34	< 2	3.5	27.5	38.2	5	34.3
35	Range	2 - 8	5.0	15.3	5	12.8
49			Range	17 - 29		

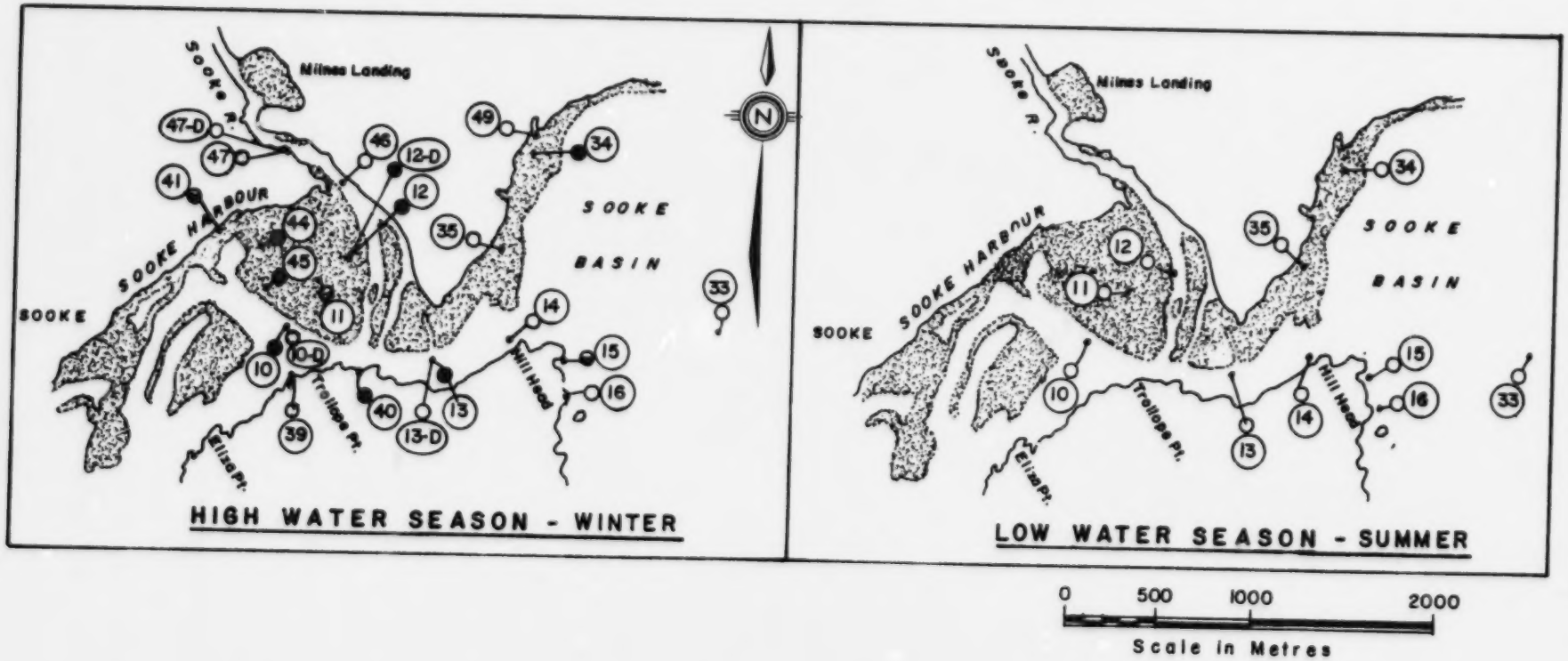

FIGURE 7 FECAL COLIFORM RESULTS - SUMMER AND WINTER - SOOKE FLATS, BILLINGS SPIT

Table 7 presents a summary of the data for stations 34, 35, and 49. During August counts from both stations were low however, a littleneck clam sample taken from the vicinity of station 35 produced an MPN of 130/100 g. Although this is below the 230 FC/100 g wholesale market guideline, the elevated count indicates contamination associated witn some aspect of the clam habitat not evident in the overlying waters. Contamination could be associated with groundwater percolation. Although a sediment sample was not taken from this area, conversation with local residents did indicate that saltwater intrusion of the lower elevations in this area does occur on high tides. Along this foreshore it is conceivable that in the case of those residents immediately fronting the foreshore, tile field effluents could be transported through clam beds via receding tides. A sanitary investigation of the area did not reveal a definite source of contamination.

December counts for station 35 proved to be higher but still within the standard. Two elevated counts of 27 and 14 FC/100 ml occured on December 9th and 10th respectively. Salinities were low in both cases and it is not clear if this is due to the influence of the Sooke River circulation patterns or to local conditions in the form of groundwater intrusion. There were no direct sources of contamination to this area.

Station 34 closer to the mouth of Lannon Creek (S4) exceeded the shellfish growing water quality median during December (Median MPN = 27.5 FC/100 ml). The most likely reason for this would be the influence of landwash as the result of rainfall and the contributions from Lannon Creek. Correlation data for FC vs salinity on station 34 shows an inverse relationship ($r = -.69$) while FC vs 48 hour antecedent rainfall indicates a significant relationship ($r = -.94$).

Marine station 49 was placed directly in the plume of Lannon Creek but still in the intertidal zone and for three days of sampling counts ranged from 17 to 79 FC/100 ml. Lannon Creek had a mean fecal coliform level of 33 FC/100 ml during December. Summer survey levels were considerably higher (mean FC = 253/100 ml) but flows were smaller. The creek watershed contains small hobby farms from which runoff feeds tributary drainage streams S30 and S34. Both streams were sampled once during December and results suggested that the contamination in Lannon Creek was originating from S34

(S30 = 2 FC/100 ml, S34 = 46 FC/100 ml). Tributary S34 drains a farm animal pasture area immediately prior to entering Lannon Creek.

Sanitary investigation of the west shores of Sooke Basin during the December survey resulted in three potential pollution problems being identified, two of which were referred to the Regional Health Services to be corrected. These included a small trailer at Ocean Village located close to the foreshore that did not have proper sewage treatment and disposal facilties and a malfunctioning sewage disposal field serving the apartment complex Beachcomber Estates. In this case effluent from a secondary sewage treatment package plant was being pumped to the disposal field that appeared to have a broken pipe.

4.2.2 Hutchinson Cove.

TABLE 8 MPN DATA HUTCHINSON COVE

STATION	AUGUST		DECEMBER		COMBINED	
	Median	90th	Median	90th	Median	90th
30	12	33	13	17	13	31.4
31	< 2	27	11	23	7	32.0
43			16.5	22.4	16.5	22.4
50			Range	5 - 8		
30 31 43			12	22.4		
All stations			11	22.1		

A summary of data for both survey periods and combined survey data for each is presented in Table 8. Although some contamination was found in all stations during both surveys only station 43, sampled during the December survey, exceeded the median standard for shellfish growing water criteria.

Hutchinson Cove was last surveyed in 1975 (Arney and Gaertner, 1975). Contamination occured in all stations with one station exceeding growing water criteria. That station, situated off the mouth of freshwater

station S43 of the present survey, produced an MPN 90th percentile of 97.6 FC/100 ml. The station was not sampled during this survey.

Two stations (S30 and S31), sampled close to the head of the Cove during the summer, indicated that contamination was present in the water column but not in sufficient quantities to contaminate the water to unacceptable levels. Clam samples taken from stations 30 and 31 produced counts of 270 and 1300 FC/100 g respectively, while sediment samples from the vicinity of station 31 ranged in values from 40 to 70 FC/100 g. These values support the theory that contamination is associated with the waters in the Cove rather than the sediment. Freshwater station S6 (Vietch Creek) had a mean of 22 FC/100 ml during August, however flows were small.

In light of the high counts found in the tissue samples during the summer survey one additional station (43) was placed closer to the head of the Cove during December. Regression analysis for fecal coliform data vs antecedent 48 hour rainfall and fecal coliform vs salinity for station 43 showed good correlation ($r = .82$ and $r = -.80$). Vietch Creek flows increased significantly from the summer. Mean fecal coliform values were 17 FC/100 ml. Station 50 sampled further out from the mouth of the Cove had very low counts and indicated that contamination was coming from the head of the cove rather than from the basin. A sanitary investigation of the area showed some possible sources of contamination but no obvious point sources that would cause the pollution observed in the marine waters.

4.2.3 Sooke Basin East. Marine stations 28 and 29 were established to evaluate the growing water quality conditions around the area of the Grouse Nest Resort. Both stations met the approved growing water quality criteria for molluscan shellfish. Previous work done in that area by the Environmental Protection Service (Arney and Gaertner, 1975) indicated numerous direct discharges from the lodge and cottages. Two stations during this survey exceeded the allowable limits for shellfish waters.

Further investigation (Shepherd, 1981) noted the resort was being periodically used by the owner and it concluded that, "future plans for the Grouse Nest are unsettled and survey of the area would not be warranted unless a significant clam resources was identified." The resort did not appear to be occupied during that survey.

The present survey identified five direct discharges from the resort. Discussion with resident manager and caretaker concerning the treatment and disposal methods being used at the resort is illustrated in Figure 8. The two direct discharges north of the cabana are stormwater drains while the pipe immediately west of the cabana is an overflow from the septic tank servicing the cabana washroom. South of this overflow is the discharge from the main lodge. The lodge is serviced by a large septic tank in series with a small septic tank. These two systems are pumped when required. The final discharge is south of the pool area towards Kellet Point. This a septic tank and straight pipe which services one cabin. The rest of the cottages have septic tank and conventional tile field systems. The manager presently lives in one of these cabins.

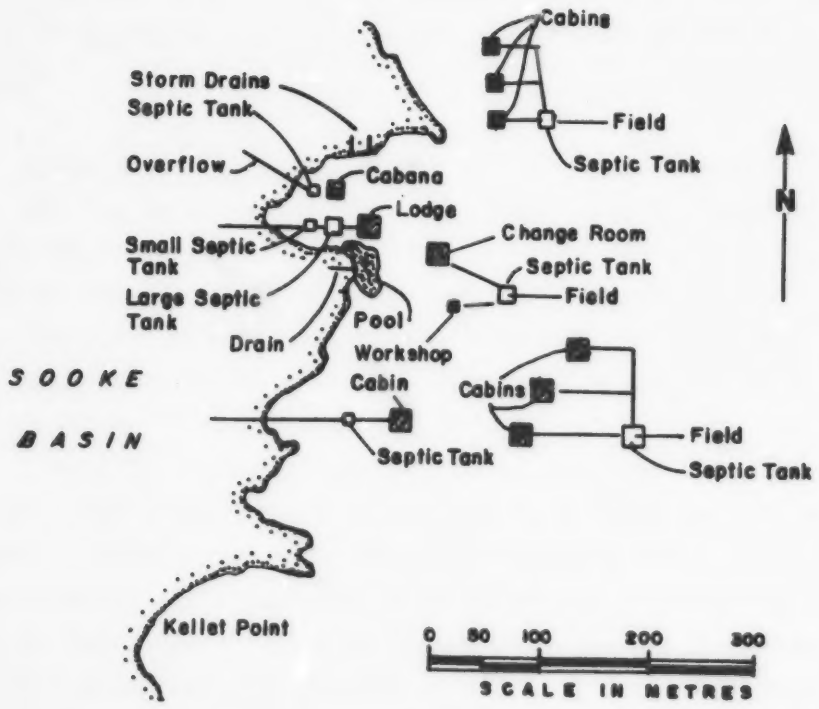

FIGURE 8 DISPOSAL SYSTEM, GROUSE NEST RESORT - SOOKE HARBOUR AND BASIN AUGUST, 1983

4.2.4 **Roche Cove.** The last shellfish survey of this area (Arney and Gaertner, 1975) found one station over standard. That station was situated in the same position as station 26 of this survey and there were no obvious reasons cited for the contamination. The two marine stations in Roche Cove (26, 27) during this survey met the approved shellfish growing water criteria.

Shellstock sampled from the cove on the 9th and 10th of August produced MPN counts of 20 and 5400 FC/100 g respectively. These samples were taken from the vicinity of station 26 and there was no obvious reasons for the high count. Sediment samples taken from the same location on August 9th and 12th recorded MPN values of 20 and 80 FC/100 g.

Two freshwater streams were sampled in the cove during December. Station S20 on the north side of the Cove and S21 at the head of the Cove did not contain significant levels of the fecal coliform organism. Sanitary survey of the area showns that S21 (Matheson Creek) drains Matheson Lake, an area that is designated Provincial Park. Both streams drain areas that are uninhabited.

4.2.5 **Sooke Basin Southeast Corner.** Stations 24 and 25 met the approved growing water standard, with higher counts observed during the summer survey. Freshwater stations S22 and S23 had low levels of contamination however, these were not considered significant.

The 1975 survey identified a direct discharge from a small guest cabin on the east side of the bay. While this discharge still exists, the resident caretaker indicated that the cabin is rarely used.

Figure 9 represents the layout of the septic tank/disposal field for the main house and caretakers residence as supplied by the caretaker. Septic tank effluent from both residences gravity feeds to a holding tank whereupon a level activated pump distributes the effluent to a tile field set back on the property from the foreshore. During the summer survey, a pump failure accounted for effluent overflowing the embankment to a small cove west of station 23. The pump was repaired prior to the December survey.

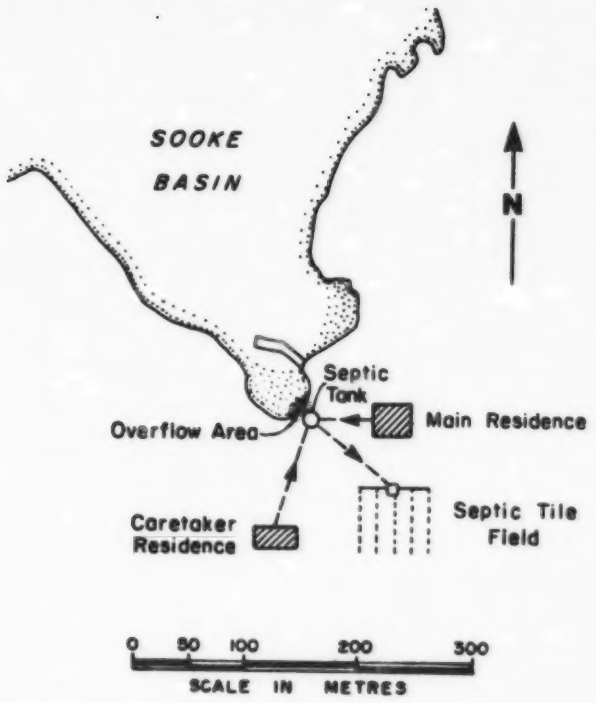

FIGURE 9 DISPOSAL SYSTEM - 1126 GILLESPIE ROAD

In the vicinity of marine stations 21 and 22, the previous study identifed a straight pipe discharge from the guest cottage on the Barren property. This discharge has been removed and both stations met the approved growing water standard.

4.2.6 Anderson Cove. Summarized data for marine stations in Anderson Cove is presented in Table 9 and all stations during both survey periods met the growing water standard. Station 18 had the highest results with a median of 9 MPN/100 ml and while this is below the standard, a sediment sample taken from this area on August 10, 1983 produced a result of 1300 MPN/100 g while a shellstock samples of mixed littleneck clams sampled

on August 10 and 11 produced counts of 460 and 110 MPN/100 g. These counts indicate a source of contamination that is not associated with the water column but more likely the result of contaminated sediment and/or groundwater.

TABLE 9 MPN DATA ANDERSON COVE

STATION	AUGUST		DECEMBER		COMBINED	
	Median	90th	Median	90th	Median	90th
18	9	13.4	7.5	38.2	7.5	11
19	< 2	7.6	3	15.3	2	11
20	3.5	12.2	6		5	11
42	-	-	7	17	7	9
48	-	-	Range 8 - 23			
51	-	-	Two Values 13 & 2			

Two freshwater stations (S18, S19) did not show significant contamination and would not appear to be the cause of the elevated counts found in the sediment and shellstock samples. Both creeks ran during the December survey only and flows were the direct result of rainfall. Population equivalents for each creek were less than 1.

A sanitary survey of this portion of the Cove did not identify a point source of fecal pollution to the area. Residents along the west and northwest shores of the cove were individually interviewed concerning on-site waste disposal practices and all systems appeared to be functioning properly. In that the entrance to the Cove is very confined, the numbers of overnight boaters using the Cove as an anchorage area is minimal. There were no overnight boaters in the Cove during either survey period. One possible source of contamination to the area around stations 18 and 19 is the resident duck population.

Anderson Cove has been identified in the Crown Foreshore Plan as a mariculture location. Historically mariculture activities have predominately taken place in the southeast corner of the cove. Problems concerning sewage

disposal and non-point sources of contamination have been documented in past surveys ultimately resulting in the closure of this area. For the purposes of this survey marine stations 42, 48, 51, and 20 were sampled to evaluate the water quality of the existing closure.

Previous work done by the Environmental Protection Service in 1975 found unacceptable water quality (90th percentile MPN = 47.8) in the vicinity of stations 48 and 51 of this survey (Arney and Gaertner, 1975). No definite source of contamination was identified although it was speculated that cattle pastured in the area may have been responsible for the increased counts.

Subsequent work in the same area in 1976 by the Department of Fisheries and Oceans, Fish Inspection Division (Holmes, 1976) over a period covering August through to October reported contamination in two areas. These areas were approximately in the same positions as stations 48 and 51 of the present study. That study found that contamination in the vicinity of station 48 was due to seepage from a septic field that serviced a house shoreside of that station. Contamination at station 51, although not substantiated, was hypothesized to originate from an underground flow that surfaces to a small pool of water inland of that station. Fecal pollution of unknown origin ultimately reaches the inlet by the stream flowing from the pool into the head of the bay at station 51 (S32 of the present study).

The Environmental Protection Service carried out further investigative work in January 1981 and again found fecal contamination in the area around stations 48 and 51 (Shepherd, 1981). Values were low ranging between 2 and 23 FC/100 ml (Median MPN = 13/100 ml). The home in the vicinity of station 48 did not appear to be occupied at the time of that study nor was the shellfish processing plant in operation.

The present study, as previously mentioned, did not find significant amounts of contamination in the marine waters from this area. Sediment samples taken from station 20 recorded an MPN value of 70/100 g while two shellstock samples (oysters) recorded levels of 40 and 330 FC/100 g respectively. Freshwater station S32 enters the Cove near marine stations 51 and 20 and had one high count of 105 FC/100 ml. This is the same stream that was speculated to have a source of contamination originating from an

underground flow. That was not substantiated during this survey however, the contamination introduced by this stream to the small bay could account for the elevated counts found in the shellstock and in the marine sediments. It is also reasonable to suggest that this stream in combination with other diffuse sources, such as landwash, is responsible for the water quality of stations 20 and 51.

Station 48 was situated opposite the now abandoned shucking plant. For three days of sampling, counts ranged from 8 to 23 MPN/100 ml. Investigation of the area identified two sources of fecal contamination that could account for the elevated levels found in the marine waters. Freshwater S17 flows into the head of the cove where station 48 is situated and over five days of sampling had a mean fecal coliform count of 19/100 ml. The second source originated from the disposal field serving the residence on the lease property. Inspection of the septic tank and disposal field showed the septic tank to be completely full to the point of overflowing and the tile field to be surfacing and leaching to the inlet. Community Health Services were informed of this situation and repairs or renewal of the system have been requested under the Provincial Sewage Disposal Regulations.

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APPENDIX I

DAILY DATA RECORD FOR MARINE SAMPLE STATIONS

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK001	48 21.59	123 42.22	83/08/09	1610	High Slack	<2	32.0
			83/08/10	1515	High Slack	2	32.0
			83/08/10	2020	Ebb	<2	33.0
			83/08/11	0825	Ebb	5	32.0
			83/08/11	1705	High Slack	<2	32.0
			83/08/12	0800	Ebb	<2	32.0
			83/08/12	1535	Flood	<2	32.0
			83/08/13	0820	Ebb	<2	32.0
			83/08/13	1540	Flood	<2	30.0
			83/08/14	0905	Ebb	<2	32.0
			83/08/14	1445	Flood	<2	31.0
			83/12/06	1520	Ebb	<2	28.0
			83/12/09	1040	Flood	13	28.0
			83/12/10	1100	High Slack	2	28.0
			83/12/11	0950	High Slack	13	26.5
SK002	48 21.75	123 42.78	83/08/09	1600	High Slack	<2	32.0
			83/08/10	1515	High Slack	2	32.0
			83/08/10	2015	Ebb	33	32.0
			83/08/11	0825	Ebb	23	33.0
			83/08/11	1700	High Slack	<2	32.0
			83/08/12	0800	Ebb	<2	31.0
			83/08/12	1540	Flood	<2	32.0
			83/08/13	0820	Ebb	<2	32.0
			83/08/13	1540	Flood	<2	30.0
			83/08/14	0905	Ebb	<2	32.0
			83/08/14	1445	Flood	<2	32.0
			83/12/06	1525	Ebb	5	30.0
			83/12/07	1615	Ebb	<2	30.0
			83/12/08	1515	Ebb	49	28.0
			83/12/09	1040	Flood	2	28.0
			83/12/10	1105	High Slack	5	29.0
			83/12/11	0950	High Slack	8	28.5
SK003	48 21.86	123 42.35	83/08/09	1610	High Slack	<2	32.0
			83/08/10	1510	High Slack	2	30.5
			83/08/10	2015	Ebb	2	31.0
			83/08/11	0825	Ebb	8	32.0
			83/08/11	1700	High Slack	<2	32.0
			83/08/12	0755	Ebb	9	32.0
			83/08/12	1530	Flood	<2	32.0
			83/08/13	0815	Ebb	<2	32.0
			83/08/13	1535	Flood	2	30.0
			83/08/14	0900	Ebb	<2	32.0
			83/08/14	1440	Flood	<2	32.0
			83/12/06	1530	Ebb	5	30.0
			83/12/07	1615	Ebb	2	30.0
			83/12/08	1520	Ebb	23	30.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK003	continued...		83/12/09	1045	Flood	8	30.0
			83/12/10	1105	High Slack	14	30.0
			83/12/11	0955	High Slack	<2	30.0
SK00[illegible]	48 21.90	123 42.08	83/08/09	1615	High Slack	<2	32.0
			83/08/10	1505	Flood	<2	30.0
			83/08/10	2010	Ebb	<2	31.0
			83/08/11	0820	Ebb	4	32.0
			83/08/11	1655	High Slack	<2	32.0
			83/08/12	0750	Ebb	<2	32.0
			83/08/12	1530	Flood	<2	30.0
			83/08/13	0815	Ebb	5	32.0
			83/08/13	1535	Flood	<2	30.0
			83/08/14	0900	Ebb	<2	32.0
			83/08/14	1440	Flood	<2	31.0
			83/12/06	1535	Ebb	8	30.0
			83/12/09	1050	Flood	2	28.0
			83/12/10	1110	High Slack	5	30.0
			83/12/11	0955	High Slack	8	28.0
SK005	48 21.82	123 43.44	83/08/09	1620	High Slack	<2	32.0
			83/08/10	1520	High Slack	<2	32.0
			83/08/10	2025	Ebb	2	32.0
			83/08/11	0830	Ebb	<2	33.0
			83/08/11	1710	High Slack	<2	32.0
			83/08/12	0800	Ebb	<2	32.0
			83/08/12	1545	Flood	<2	32.0
			83/08/13	1540	Flood	<2	30.0
			83/08/14	0910	Ebb	2	31.0
			83/08/14	1445	Flood	<2	31.0
			83/12/06	0900	Flood	2	28.0
			83/12/06	1535	Ebb	2	30.0
			83/12/07	1610	Ebb	2	30.0
			83/12/08	1530	Ebb	17	20.0
			83/12/09	1050	Flood	17	30.0
			83/12/10	1110	High Slack	13	18.0
			83/12/11	0955	High Slack	<2	26.0
SK006	48 21.74	123 43.75	83/08/09	1630	High Slack	<2	32.0
			83/08/10	1515	Flood	2	32.0
			83/08/10	2020	Ebb	<2	32.0
			83/08/11	0830	Ebb	8	32.0
			83/08/11	1710	High Slack	17	32.0
			83/08/12	0805	Ebb	5	32.0
			83/08/12	1550	Flood	5	32.0
			83/08/13	0825	Ebb	2	31.0
			83/08/13	1540	Flood	2	32.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK006	continued...		83/08/14	0910	Ebb	2	31.0	
			83/08/14	1445	Flood	<2	32.0	
			83/12/06	1540	Ebb	17	27.0	
			83/12/07	1610	Ebb	11	28.0	
			83/12/08	1525	Ebb	<2	30.0	
			83/12/09	1050	Flood	33	16.0	
			83/12/10	1110	High Slack	17	27.5	
			83/12/11	1000	High Slack	220	20.0	
SK007	48 22.05	123 42.61	83/08/09	1555	High Slack	<2	32.0	
			83/08/10	1505	Flood	4	30.0	
			83/08/10	2010	Ebb	2	32.0	
			83/08/11	0820	Ebb	2	32.0	
			83/08/11	1650	High Slack	2	30.0	
			83/08/12	0745	Ebb	<2	32.0	
			83/08/12	1525	Flood	<2	32.0	
			83/08/13	0810	Ebb	5	32.0	
			83/08/13	1535	Flood	<2	30.0	
			83/08/14	0855	Ebb	5	32.0	
			83/08/14	1340	Low Slack	<2	31.0	
			83/12/06	1545	Ebb	<2	30.0	
			83/12/07	1610	Ebb	2	30.0	
			83/12/08	1530	Ebb	2	30.0	
			83/12/09	1055	Flood	17	16.0	
			83/12/10	1115	High Slack	13	24.0	
			83/12/11	1005	High Slack	5	26.0	
SK008	48 22.25	123 42.70	83/08/09	1550	High Slack	<2	32.0	
			83/08/09	1550	High Slack	5	32.0	*
			83/08/10	1455	Flood	<2	30.5	
			83/08/10	1455	Flood	<2	31.0	*
			83/08/10	2005	Ebb	2	32.0	
			83/08/10	2005	Ebb	7	31.0	*
			83/08/11	0810	Ebb	8	32.0	
			83/08/11	0810	Ebb	<2	32.0	*
			83/08/11	1650	High Slack	2	31.0	
			83/08/12	0745	Ebb	<2	32.0	
			83/08/12	1525	Flood	<2	31.0	
			83/08/13	0810	Ebb	<2	32.0	
			83/08/13	1530	Flood	<2	30.0	
			83/08/14	0855	Ebb	5	32.0	
			83/08/14	1335	Low Slack	<2	31.0	
			83/12/06	0905	Flood	2	27.5	
			83/12/06	1555	Ebb	7	28.0	
			83/12/07	0830	Flood	4	27.0	
			83/12/07	1605	Ebb	<2	28.0	
			83/12/07	1605	Ebb	<2	30.0	*

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK008	continued...		83/12/08	0850	Flood	2	28.0	
			83/12/08	1545	Ebb	17	20.0	
			83/12/08	1545	Ebb	<2	30.0	*
			83/12/09	1055	Flood	14	20.0	
			83/12/09	1100	Flood	<2	30.0	*
			83/12/10	1125	High Slack	5	20.0	
			83/12/10	1125	High Slack	2	30.0	*
			83/12/11	1010	High Slack	5	22.0	
			83/12/11	1010	High Slack	<2	28.5	*
SK009	48 22.57	123 42.65	83/08/09	1545	High Slack	<2	32.0	
			83/08/09	1545	High Slack	<2	32.0	*
			83/08/10	1450	Flood	<2	32.0	
			83/08/10	1450	Flood	2	31.0	*
			83/08/10	1950	Ebb	<2	32.0	
			83/08/10	1950	Ebb	<2	31.0	*
			83/08/11	0805	Ebb	4	32.0	
			83/08/11	0805	Ebb	4	31.0	*
			83/08/11	1645	High Slack	<2	30.0	
			83/08/12	0740	Ebb	<2	31.0	
			83/08/12	1520	Flood	2	31.0	
			83/08/13	0810	Ebb	<2	32.0	
			83/08/13	1525	Flood	<2	30.0	
			83/08/14	0845	Ebb	5	32.0	
			83/08/14	1335	Low Slack	<2	31.0	
			83/12/06	0910	Flood	8	26.5	
			83/12/06	1600	Ebb	2	26.0	
			83/12/07	0830	Flood	8	26.0	
			83/12/07	1600	Ebb	8	28.0	
			83/12/08	1550	Ebb	13	24.0	
			83/12/09	0855	Flood	49	26.0	
			83/12/09	1105	Flood	33	11.0	
			83/12/10	1130	High Slack	17	12.0	
			83/12/11	1015	High Slack	11	12.0	
SK010	48 22.65	123 42.10	83/08/09	1540	High Slack	<2	32.0	
			83/08/10	1445	Flood	<2	32.0	
			83/08/10	1950	Ebb	<2	31.0	
			83/08/11	0800	Ebb	<2	32.0	
			83/08/11	1640	High Slack	8	32.0	
			83/08/12	0740	Ebb	11	32.0	
			83/08/12	1520	Flood	2	32.0	
			83/08/13	0805	Ebb	5	31.0	
			83/08/13	1525	Flood	<2	30.0	
			83/08/14	0840	Ebb	6	30.0	
			83/08/14	1330	Low Slack	2	31.0	
			83/12/06	0920	Flood	13	26.5	

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK010	continued...		83/12/06	1605	Ebb	11	24.0	
			83/12/07	0830	Flood	<2	27.0	
			83/12/07	1455	Ebb	<2	27.0	
			83/12/08	0900	Flood	14	25.0	
			83/12/08	1555	Ebb	49	16.0	
			83/12/08	1555	Ebb	7	27.5	*
			83/12/09	1110	Flood	350	14.0	
			83/12/09	1110	Flood	2	30.0	*
			83/12/10	1135	High Slack	17	16.0	
			83/12/10	1135	High Slack	<2	28.0	*
			83/12/11	1020	High Slack	17	16.5	
			83/12/11	1020	High Slack	<2	28.0	*
SK011	48 22.83	123 41.90	83/08/09	1540	High Slack	5	31.0	
			83/08/10	1410	Flood	2	30.0	
			83/08/10	1945	Ebb	2	30.0	
			83/08/11	0800	Ebb	17	30.0	
			83/08/11	1640	High Slack	<2	31.0	
			83/08/12	0735	Ebb	<2	32.0	
			83/08/12	1600	Flood	2	32.0	
			83/08/13	0805	Ebb	8	30.0	
			83/08/13	1520	Flood	<2	30.0	
			83/08/14	0840	Ebb	<2	30.0	
			83/08/14	1330	Low Slack	<2	32.0	
			83/12/06	0925	Flood	5	28.0	
			83/12/06	1620	Ebb	2	26.0	
			83/12/07	0835	Flood	5	26.0	
			83/12/07	1540	Ebb	5	22.0	
			83/12/08	0905	Flood	8	26.0	
			83/12/08	1605	Ebb	79	13.0	
			83/12/09	1125	Flood	240	12.0	
			83/12/10	1145	High Slack	33	25.5	
			83/12/11	1030	High Slack	23	13.5	
SK012	48 22.85	123 41.69	83/08/09	1525	High Slack	7	30.0	
			83/08/10	1405	Flood	5	30.0	
			83/08/10	1945	Ebb	2	30.0	
			83/08/11	0755	Ebb	33	28.0	
			83/08/11	1630	High Slack	<2	30.0	
			83/08/12	0730	Ebb	5	31.0	
			83/08/12	1605	Flood	<2	30.0	
			83/08/13	0800	Ebb	13	30.0	
			83/08/13	1515	Flood	5	29.0	
			83/08/14	0830	Ebb	5	30.0	
			83/08/14	1325	Low Slack	<2	30.0	
			83/12/06	0930	Flood	46	.0	
			83/12/06	1625	Ebb	13	18.0	

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TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK012	continued...		83/12/07	0840	Flood	23	7.5	
			83/12/07	1545	Ebb	5	23.0	
			83/12/07	1545	Ebb	8	26.0	*
			83/12/08	0905	Flood	46	18.0	
			83/12/08	1605	Ebb	70	4.0	
			83/12/08	1605	Ebb	33	16.0	*
			83/12/09	1125	Flood	17	4.0	
			83/12/09	1125	Flood	17	20.0	*
			83/12/10	1145	High Slack	13	4.0	
			83/12/10	1145	High Slack	23	22.0	*
			83/12/11	1035	High Slack	8	4.0	
			83/12/11	1035	High Slack	5	26.0	*
SK013	48 22.60	123 41.42	83/08/09	1520	High Slack	5	31.0	
			83/08/10	1355	Flood	2	31.0	
			83/08/10	1940	Ebb	<2	31.0	
			83/08/11	0750	Ebb	<2	32.0	
			83/08/11	1630	Flood	2	31.0	
			83/08/12	0730	Ebb	<2	32.0	
			83/08/12	1515	Flood	<2	32.0	
			83/08/13	0750	Ebb	<2	31.0	
			83/08/13	1505	Flood	5	30.0	
			83/08/14	0825	Ebb	<2	30.0	
			83/08/14	1325	Low Slack	<2	30.0	
			83/12/06	0935	Flood	31	3.5	
			83/12/06	1625	Ebb	2	25.0	
			83/12/07	0845	Flood	5	25.0	
			83/12/07	1510	Ebb	5	26.0	
			83/12/07	1510	Ebb	<2	28.0	*
			83/12/08	0910	Flood	23	22.0	
			83/12/08	1505	Ebb	22	20.0	
			83/12/08	1505	Ebb	4	29.5	*
			83/12/09	1140	Flood	23	9.0	
			83/12/09	1145	Flood	<2	30.0	*
			83/12/10	1210	High Slack	33	13.5	
			83/12/10	1210	High Slack	<2	30.0	*
			83/12/11	1055	High Slack	23	4.0	
			83/12/11	1055	High Slack	2	30.0	*
SK014	48 22.64	123 41.09	83/08/09	1520	High Slack	<2	32.0	
			83/08/10	1355	Flood	<2	31.0	
			83/08/10	1940	Ebb	<2	30.0	
			83/08/11	0750	Ebb	<2	31.0	
			83/08/11	1625	Flood	<2	30.0	
			83/08/12	0730	Ebb	2	32.0	
			83/08/12	1510	Flood	2	32.0	
			83/08/13	0740	Ebb	8	32.0	

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK014	continued...		83/08/13	1500	Flood	<2	31.0
			83/08/14	0825	Ebb	<2	30.0
			83/08/14	1320	Low Slack	<2	32.0
			83/12/06	1630	Ebb	2	25.5
			83/12/07	1455	Ebb	5	26.0
			83/12/08	1500	High Slack	8	25.0
			83/12/09	1155	Flood	13	14.0
			83/12/10	1215	High Slack	4	22.0
			83/12/11	1055	High Slack	11	12.0
SK015	48 22.55	123 40.85	83/08/09	1450	High Slack	<2	31.0
			83/08/10	1935	Ebb	<2	30.0
			83/08/11	0750	Ebb	<2	31.0
			83/08/12	0820	Ebb	<2	32.0
			83/08/13	0740	Ebb	11	31.0
			83/08/14	0815	Ebb	<2	31.0
			83/12/07	1450	Ebb	2	26.0
			83/12/08	1450	High Slack	5	26.0
			83/12/09	1305	Flood	130	22.0
			83/12/10	1230	High Slack	7	22.0
			83/12/11	1110	High Slack	23	20.5
SK016	48 22.47	123 40.82	83/08/09	1450	High Slack	<2	30.0
			83/08/10	1930	Ebb	<2	30.0
			83/08/11	0750	Ebb	<2	31.0
			83/08/12	0820	Ebb	<2	31.0
			83/08/13	0740	Ebb	11	31.0
			83/08/14	0815	Ebb	<2	31.0
			83/12/07	1450	Ebb	5	26.0
			83/12/08	1450	High Slack	5	16.0
			83/12/09	1305	Flood	8	25.0
			83/12/10	1230	High Slack	5	23.0
			83/12/11	1110	High Slack	5	14.0
SK017	48 21.89	123 39.55	83/08/09	1445	High Slack	<2	31.0
			83/08/10	1920	Ebb	2	30.0
			83/08/11	0745	Ebb	<2	31.0
			83/08/12	0830	Ebb	5	31.0
			83/08/13	0735	Ebb	<2	31.0
			83/08/14	0805	Ebb	2	30.0
			83/12/07	1445	Ebb	<2	26.0
			83/12/08	1445	High Slack	2	26.0
			83/12/09	1300	Flood	33	26.0
			83/12/10	1235	High Slack	7	25.0
			83/12/11	1120	High Slack	8	22.5
SK018	48 21.70	123 39.60	83/08/09	1440	High Slack	2	31.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK018	continued...		83/08/10	1915	Ebb	7	30.0
			83/08/11	0740	Ebb	17	31.0
			83/08/12	0835	Ebb	11	31.0
			83/08/13	0730	Ebb	11	32.0
			83/08/14	0800	Ebb	2	30.0
			83/12/06	1010	Flood	7	22.0
			83/12/07	0900	Flood	2	18.0
			83/12/07	1425	High Slack	8	20.0
			83/12/08	0920	Flood	<2	22.0
			83/12/08	1430	High Slack	11	22.0
			83/12/09	1255	Flood	8	22.0
			83/12/10	1240	High Slack	5	7.0
			83/12/11	1130	High Slack	8	28.0
SK019	48 21.58	123 39.43	83/08/09	1435	Flood	<2	30.0
			83/08/10	1915	Ebb	<2	32.0
			83/08/11	0740	Ebb	<2	30.0
			83/08/12	0840	Ebb	<2	31.0
			83/08/13	0730	Ebb	13	30.0
			83/08/14	0800	High Slack	4	30.0
			83/12/06	1015	Flood	<2	23.0
			83/12/07	0900	Flood	8	20.0
			83/12/07	1425	High Slack	2	23.0
			83/12/08	0920	Flood	2	22.0
			83/12/08	1550	Ebb	4	24.0
			83/12/09	1255	Flood	33	18.0
			83/12/10	1240	High Slack	5	13.0
			83/12/11	1130	High Slack	2	17.0
SK020	48 21.63	123 39.12	83/08/09	1430	High Slack	5	30.0
			83/08/10	1910	Ebb	5	30.0
			83/08/11	0735	Ebb	23	31.0
			83/08/12	0845	Ebb	<2	30.0
			83/08/13	0730	Ebb	<2	31.0
			83/08/14	0755	High Slack	2	30.0
			83/12/06	1020	Flood	13	22.5
			83/12/07	0905	Flood	2	23.5
			83/12/07	1430	High Slack	5	24.0
			83/12/08	0925	Flood	5	22.0
			83/12/08	1425	High Slack	5	22.5
			83/12/09	1250	Flood	7	25.0
			83/12/10	1245	High Slack	7	20.0
			83/12/11	1135	High Slack	8	22.0
SK021	48 21.95	123 38.78	83/08/09	1425	Flood	<2	31.0
			83/08/10	1910	Ebb	<2	30.0
			83/08/11	0735	Ebb	<2	30.0

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TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK021	continued...		83/08/12	0855	Ebb	<2	31.0
			83/08/13	0725	Ebb	2	32.0
			83/08/14	0750	High Slack	<2	31.0
			83/12/07	1410	High Slack	<2	26.0
			83/12/08	1420	High Slack	2	26.0
			83/12/09	1245	Flood	13	25.0
			83/12/10	1255	High Slack	2	24.5
			83/12/11	1140	High Slack	33	24.0
SK022	48 21.89	123 38.70	83/08/09	1425	Flood	2	30.0
			83/08/10	1910	Ebb	<2	30.0
			83/08/11	0735	Ebb	<2	30.0
			83/08/12	0855	Ebb	<2	31.0
			83/08/13	0725	Ebb	<2	30.0
			83/08/14	0750	High Slack	<2	32.0
			83/12/08	1420	High Slack	17	25.5
			83/12/09	1245	Flood	5	24.0
			83/12/10	1255	High Slack	5	25.0
			83/12/11	1140	High Slack	4	24.0
SK023	48 21.83	123 38.55	83/08/09	1420	Flood	<2	30.0
			83/08/10	1905	Ebb	33	31.0
			83/08/11	0730	Ebb	8	31.0
			83/08/12	0900	Ebb	5	32.0
			83/08/13	0725	Ebb	2	30.0
			83/08/14	0750	High Slack	5	30.0
			83/12/08	1415	High Slack	<2	25.0
			83/12/09	1245	Flood	5	24.0
			83/12/10	1255	High Slack	23	24.0
			83/12/11	1140	High Slack	<2	22.0
SK024	48 22.83	123 38.03	83/08/09	1420	Flood	<2	30.0
			83/08/10	1900	Ebb	<2	30.0
			83/08/11	0730	Ebb	33	31.0
			83/08/12	0905	Ebb	<2	30.0
			83/08/13	0720	Ebb	<2	30.0
			83/08/14	0745	High Slack	<2	31.0
			83/12/07	1405	High Slack	<2	24.0
			83/12/08	1415	High Slack	<2	25.0
			83/12/09	1240	Flood	<2	22.0
			83/12/10	1315	High Slack	5	22.5
			83/12/11	1145	High Slack	<2	22.0
K025	48 22.05	123 37.90	83/08/09	1415	Flood	<2	32.0
			83/08/10	1900	Ebb	8	30.0
			83/08/11	0730	Ebb	33	31.0
			83/08/12	0905	Ebb	<2	31.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK025	continued...		83/08/13	0720	Ebb	23	30.0
			83/08/14	0745	High Slack	2	31.0
			83/12/07	1405	High Slack	2	25.0
			83/12/08	1410	High Slack	<2	24.0
			83/12/09	1240	Flood	5	25.0
			83/12/10	1310	High Slack	11	23.0
			83/12/11	1145	High Slack	5	22.0
SK026	48 22.22	123 37.45	83/08/09	1410	Flood	<2	30.0
			83/08/10	1855	Ebb	<2	28.0
			83/08/11	0725	Ebb	33	28.0
			83/08/12	0915	Ebb	<2	30.0
			83/08/13	0715	Ebb	<2	30.0
			83/08/14	0735	High Slack	5	28.0
			83/12/07	1400	High Slack	2	24.0
			83/12/08	1405	High Slack	2	20.0
			83/12/09	1230	Flood	2	23.0
			83/12/10	1310	High Slack	5	20.5
			83/12/11	1155	High Slack	5	12.0
SK027	48 22.28	123 37.63	83/08/09	1410	Flood	<2	31.0
			83/08/10	1855	Ebb	<2	32.0
			83/08/11	0725	Ebb	<2	31.0
			83/08/12	0910	Ebb	<2	31.0
			83/08/13	0715	Ebb	<2	30.0
			83/08/14	0735	High Slack	<2	30.0
			83/12/07	1400	High Slack	<2	24.0
			83/12/08	1405	High Slack	5	22.0
			83/12/09	1230	Flood	2	20.0
			83/12/10	1315	High Slack	8	8.0
			83/12/11	1150	High Slack	23	11.5
SK028	48 22.57	123 38.04	83/08/09	1405	Flood	<2	30.0
			83/08/10	1850	Ebb	8	30.0
			83/08/11	0720	Ebb	5	31.0
			83/08/12	0920	Ebb	<2	30.0
			83/08/13	0710	Ebb	<2	30.0
			83/08/14	0730	High Slack	<2	31.0
			83/12/07	1355	High Slack	2	26.0
			83/12/08	1400	High Slack	5	25.5
			83/12/09	1225	Flood	2	26.0
			83/12/10	1320	High Slack	<2	25.0
			83/12/11	1155	High Slack	<2	28.0
K029	48 22.74	123 38.02	83/08/09	1400	Flood	2	30.0
			83/08/10	1850	Ebb	<2	30.0
			83/08/11	0720	Ebb	<2	31.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK029	continued...		83/08/12	0920	Ebb	<2	31.0	
			83/08/13	0710	Ebb	<2	30.0	
			83/12/07	1355	High Slack	2	26.0	
			83/12/08	1400	High Slack	2	25.0	
			83/12/09	1225	Flood	2	26.0	
			83/12/10	1320	High Slack	2	22.5	
			83/12/11	1200	High Slack	5	24.0	
SK030	48 23.25	123 38.00	83/08/09	1400	Flood	<2	30.0	
			83/08/10	1850	Ebb	17	30.0	
			83/08/11	0715	Ebb	33	32.0	
			83/08/12	0930	Ebb	2	31.0	
			83/08/13	0705	Ebb	7	30.0	
			83/08/14	0730	High Slack	33	30.0	
			83/12/07	1345	High Slack	2	24.0	
			83/12/08	1355	High Slack	17	19.5	
			83/12/09	1210	Flood	17	10.0	
			83/12/10	1330	High Slack	13	26.0	
			83/12/11	1200	High Slack	<2	22.0	
SK031	48 23.36	123 38.05	83/08/09	1355	Flood	<2	30.0	
			83/08/10	1845	Ebb	2	30.0	
			83/08/11	0715	Ebb	33	28.0	
			83/08/12	0930	Ebb	<2	32.0	
			83/08/13	0705	Ebb	<2	30.0	
			83/08/14	0725	High Slack	23	30.0	
			83/12/07	1345	High Slack	13	25.0	
			83/12/08	1350	High Slack	33	14.0	
			83/12/09	1210	Flood	11	20.0	
			83/12/10	1330	High Slack	7	20.5	
			83/12/11	1205	High Slack	5	20.0	
SK032	48 22.64	123 39.10	83/08/09	1500	High Slack	<2	31.0	
			83/08/09	1500	High Slack	2	31.0	*
			83/08/10	1925	Ebb	<2	31.0	
			83/08/10	1930	Ebb	<2	32.0	*
			83/08/11	0845	Ebb	<2	31.0	
			83/08/12	0935	Ebb	2	31.0	
			83/08/13	0840	Ebb	<2	30.0	
			83/08/14	0810	Ebb	<2	30.0	
			83/12/09	1205	Flood	2	26.0	
			83/12/10	1335	High Slack	<2	24.0	
			83/12/11	1210	High Slack	8	23.0	
SK033	48 22.63	123 40.18	83/08/09	1500	High Slack	<2	30.0	
			83/08/09	1500	High Slack	<2	31.0	*
			83/08/10	1920	Ebb	<2	31.0	

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK033	continued...		83/08/10	1925	Ebb	<2	32.0	*
			83/08/11	0845	Ebb	2	30.0	
			83/08/12	0935	Ebb	<2	32.0	
			83/08/13	0840	Ebb	<2	30.0	
			83/08/14	0810	Ebb	<2	30.0	
			83/12/09	1205	Flood	8	26.0	
			83/12/10	1230	High Slack	23	25.5	
			83/12/11	1105	High Slack	33	23.0	
SK034	48 23.15	123 41.12	83/08/12	0720	Ebb	<2	31.0	
			83/08/13	0745	Ebb	<2	31.0	
			83/08/14	0820	Ebb	5	30.0	
			83/12/06	1635	Ebb	2	23.5	
			83/12/07	1500	Ebb	2	24.0	
			83/12/08	1455	High Slack	22	25.5	
			83/12/09	1200	Flood	46	16.0	
			83/12/10	1220	High Slack	33	24.0	
			83/12/11	1105	High Slack	33	20.0	
SK035	48 22.87	123 40.91	83/08/12	0725	Ebb	<2	31.0	
			83/08/13	0745	Ebb	2	30.0	
			83/08/14	0820	Ebb	8	30.0	
			83/12/06	0940	Flood	5	20.0	
			83/12/06	1635	Ebb	<2	24.5	
			83/12/07	0850	Flood	5	25.0	
			83/12/07	1500	Ebb	<2	26.0	
			83/12/08	0910	Flood	8	26.0	
			83/12/08	1455	High Slack	8	24.0	
			83/12/09	1155	Flood	27	12.0	
			83/12/10	1215	High Slack	14	20.5	
			83/12/11	1100	High Slack	<2	20.5	
SK036	48 21.48	123 43.31	83/12/06	1515	Ebb	5	28.0	
			83/12/09	1045	Flood	23	20.0	
			83/12/10	1100	High Slack	23	22.0	
			83/12/11	0950	High Slack	33	22.0	
SK037	48 22.30	123 42.43	83/12/06	1610	Ebb	5	29.0	
			83/12/07	1525	Ebb	8	30.0	
			83/12/08	1535	Ebb	8	22.0	
			83/12/09	1150	Flood	170	20.0	
			83/12/10	1120	High Slack	13	24.0	
			83/12/11	1005	High Slack	23	22.0	
SK038	48 22.33	123 42.30	83/12/06	0910	Flood	2	22.0	
			83/12/06	1610	Ebb	<2	28.0	
			83/12/07	1525	Ebb	5	30.0	

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
SK038	continued...		83/12/08	1535	Ebb	49	14.5
			83/12/09	1150	Flood	17	20.0
			83/12/10	1120	High Slack	13	12.5
			83/12/11	1005	High Slack	13	20.0
SK039	48 22.50	123 41.98	83/12/06	1615	Ebb	5	26.0
			83/12/07	1520	Ebb	<2	29.0
			83/12/08	1540	Ebb	33	19.0
			83/12/09	1150	Flood	49	14.0
			83/12/10	1200	High Slack	13	16.0
			83/12/11	1050	High Slack	2	15.0
SK040	48 22.52	123 41.71	83/12/06	0915	Flood	2	25.0
			83/12/06	1620	Ebb	5	27.0
			83/12/07	1550	Ebb	5	26.0
			83/12/08	1540	Ebb	17	21.0
			83/12/09	1145	Flood	23	6.0
			83/12/10	1200	High Slack	33	8.0
			83/12/11	1050	High Slack	17	4.0
SK041	48 22.96	123 42.30	83/12/06	0920	Flood	13	26.0
			83/12/06	1605	Ebb	2	22.0
			83/12/07	1530	Ebb	11	27.0
			83/12/08	1115	Flood	49	20.0
			83/12/09	1115	Flood	79	15.0
			83/12/10	1135	High Slack	13	21.0
			83/12/11	1020	High Slack	17	20.0
SK042	48 21.78	123 39.20	83/12/07	1415	High Slack	<2	25.0
			83/12/08	1420	High Slack	7	23.0
			83/12/09	1250	Flood	11	20.0
			83/12/10	1240	High Slack	7	19.0
			83/12/11	1125	High Slack	<2	21.0
SK043	48 23.32	123 37.95	83/12/06	1000	Flood	<2	23.0
			83/12/07	1345	High Slack	11	25.0
			83/12/08	1350	High Slack	23	8.0
			83/12/09	1210	Flood	22	4.0
			83/12/10	1330	High Slack	11	8.0
			83/12/11	1200	High Slack	22	1.0
SK044	48 22.90	123 42.08	83/12/07	1535	Ebb	13	25.0
			83/12/08	1120	Flood	13	28.0
			83/12/08	1605	Ebb	79	26.5
			83/12/09	1120	Flood	5	20.0
			83/12/10	1140	High Slack	17	15.0
			83/12/11	1030	High Slack	22	14.0

APPENDIX I
TABLE 1 : Daily Data Record for Marine Sample Stations
(Area 20)

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity	
SK045	48 22.78	123 42.04	83/12/07	1540	Ebb	4	25.0	
			83/12/08	0900	Flood	13	28.0	
			83/12/08	1600	Ebb	70	15.5	
			83/12/09	1120	Flood	49	13.0	
			83/12/10	1140	High Slack	7	19.0	
			83/12/11	1030	High Slack	23	16.0	
SK046	48 23.05	123 41.85	83/12/09	1130	Flood	49	2.0	
			83/12/10	1150	High Slack	17	2.0	
			83/12/11	1035	High Slack	13	4.0	
SK047	48 23.16	123 42.08	83/12/09	1135	Flood	13	.0	
			83/12/09	1135	Flood	8	25.0	*
			83/12/10	1150	High Slack	33	.0	
			83/12/10	1150	High Slack	2	27.0	*
			83/12/11	1040	High Slack	8	1.0	
			83/12/11	1040	High Slack	17	26.0	*
SK048	48 21.58	123 39.12	83/12/09	1250	Flood	8	25.0	
			83/12/10	1245	High Slack	17	20.0	
			83/12/11	1135	High Slack	23	22.5	
SK049	48 23.23	123 40.98	83/12/09	1200	Flood	17	16.0	
			83/12/10	1220	High Slack	17	20.0	
			83/12/11	1100	High Slack	79	18.0	
SK050	48 23.23	123 38.19	83/08/09	1620	High Slack	<2	32.0	*
			83/08/10	1525	High Slack	<2	31.0	*
			83/08/10	2025	Ebb	<2	32.0	*
			83/08/11	0830	Ebb	7	32.0	*
			83/12/09	1215	Flood	5	24.0	
			83/12/09	1215	Flood	<2	28.0	*
			83/12/10	1325	High Slack	8	23.0	
			83/12/10	1325	High Slack	<2	28.0	*
			83/12/11	1205	High Slack	5	20.0	
			83/12/11	1205	High Slack	<2	28.0	*
SK051	48 21.65	123 39.05	83/12/10	1250	High Slack	13	19.0	
			83/12/11	1135	High Slack	2	21.5	

APPENDIX II

FRESWATER STATION DESCRIPTIONS

APPENDIX II FRESHWATER STATION DESCRIPTIONS

STATION	DESCRIPTION
S-1	BELIVISTA CREEK AT THE MOUTH
S-2	DE MAMIEL AT THE CONFLUENCE TO SOOKE RIVER
S-3	SOOKE RIVER ABOVE THE CONFLUENCE OF DE MAMIEL CREEK
S-4	LANNON CREEK AT HIGHWAY 14
S-5	LANNON CREEK AT BLYTHEWOOD ROAD
S-6	VEITCH CREEK AT EAST SOOKE ROAD
S-7	C. RUSHTON WELL WATER
S-8	FREESE WELL WATER
S-9	LOCK WELL WATER
S-10	THURBER WELL WATER
S-11	SOOKE RIVER 500 M NORTH STN. 2
S-12	ROBERTS CREEK
S-13	CHARTERS CREEK AT THE PUMP STATION
S-14	SOOKE RIVER AT THE PARK
S-15	ROBERTS CREEK AT SOOKE RIVER ROAD
S-16	AYUM CREEK
S-17	UNNAMED CREEK TO ANDERSON COVE AT THE OLD OYSTER LEASE
S-18	UNNAMED CREEK TO ANDERSON COVE AT THE PARK
S-19	UNNAMED CREEK TO ANDERSON COVE BEFORE COVINA ROAD
S-20	UNNAMED CREEK NORTH SIDE ROCHE COVE NEAR THE HEAD
S-21	MATHESON CREEK AT THE HEAD OF ROCHE COVE
S-22	DOERR CREEK AT THE HOLM PROPERTY
S-23	UNNAMED CREEK AT THE WEST SIDE OF THE HOLM PROPERTY
S-24	SURFACE RUNOFF NO. 27 SEAGRIT ROAD
S-25	WELL WATER SOUTH OF WELL NO. 10
S-26	EAST BANK SOOKE RIVER AT THE BRIDGE
S-27	BELIVISTA CREEK
S-28	WEST BANK SOOKE RIVER AT THE BRIDGE
S-29	DRAINAGE DITCH ON GOLLEDGE ROAD
S-30	CREEK BELOW POULTRY FARM ON PARKLAND ROAD
S-31	DRAINAGE DITCH ON GOLLEDGE ROAD
S-32	UNNAMED CREEK 200 M EAST OF STATION 17
S-33	STN. 32 AFTER IT DRAINS SWAMP
S-34	SASEENOS CREEK BEFORE THE CONFLUENCE TO LANNON CREEK
S-35	CULVERT ON ELIZA PT. ROAD
S-36	DRAINAGE DITCH ON DEERLEPE ROAD
S-37	CREEK AT BROOKS RESIDENCE OPPOSITE MARINE STATION 35
S-38	CREEK BELOW STRATA CORP. #503 FRANCES GARDENS
S-39	CREEK ABOVE FRANCES GARDENS THROUP ROAD
S-40	BEACHCOMBER ESTATES SEPTIC FIELD KALTASIN ROAD
S-41	CREEK AT HWY 14 AND POLYMEDE ROAD
S-42	CULVERT ON EAST SOOKE ROAD PAST TIDEVIEW ROAD
S-43	DISCHARGE FROM SOOKE RIVER HOTEL

APPENDIX III

DAILY BACTERIOLOGICAL DATA FOR FRESHWATER
AND EFFLUENT SAMPLE STATIONS

APPENDIX III DAILY BACTERIOLOGICAL DATA FOR FRESHWATER AND EFFLUENT SAMPLE STATIONS

STATION	DATE	FC/100 ML	FS/100 ML
S1	83/08/09	260	300
	83/08/10	50	60
	83/08/11	38	110
	83/12/06	200	
	83/12/07	24	
	83/12/08	> 80	
	83/12/09	2900	100
	83/12/10	280	230
S2	83/08/09	< 10	10
	83/08/10	18	20
	83/08/11	19	18
	83/12/06	17	
	83/12/08	733 (est)	
	83/12/09	120	< 10
	83/12/10	80	
S3	83/08/09	30	10
	83/08/10	38	9
	83/08/11	40	5
	83/12/06	13	
S4	83/08/09	220	300
	83/08/10	250	230
	83/08/11	290	200
	83/12/06	16	
	83/12/09	61	28
	83/12/10	22	3
S5	83/08/09	470	540
	83/08/10	130	390
	83/08/11	430	810
	83/12/06	3	
	83/12/09	8	40
	83/12/10	1	

CONTINUED...

APPENDIX III (Continued)

STATION	DATE	FC/100 ML	FS/100 ML
S6	83/08/09 83/08/10 83/08/11 83/12/06 83/12/08 83/12/09 83/12/10	40 1 26 4 30 24 11	30 27 50
S7	83/08/14 83/12/08	0 0	103
S8	83/08/14	1	2
S9	83/08/14	0	100
S10	83/08/14 83/12/09	3 4	329 < 10
S11	83/12/06 83/12/09 83/12/10	10 16 16	
S12	83/12/06	26	
S13	83/12/06	0	
S14	83/12/06 83/12/08 83/12/09	7 14 10	
S15	83/12/06	3	

CONTINUED...

APPENDIX III (Continued)

STATION	DATE	FC/100 ML	FS/100 ML
S16	83/12/06	1	
	83/12/08	19	
	83/12/09	6	
	83/12/10	2	
S17	83/12/06	5	
	83/12/07	10	
	83/12/08	64	
	83/12/09	15	
	83/12/10	3	
S18	83/12/06	1	
	83/12/07	5	
	83/12/08	10	
	83/12/09	4	
	83/12/10	3	
S19	83/12/06	0	
	83/12/07	0	
	83/12/08	0	
	83/12/09	1	
	83/12/10	0	
S20	83/12/07	44	
	83/12/09	20	
	83/12/10	10	
S21	83/12/07	1	
	83/12/09	18	
	83/12/10	1	110
S22	83/12/07	11	
	83/12/09	4	
	83/12/10	3	

CONTINUED...

APPENDIX III (Continued)

STATION	DATE	FC/100 ML	FS/100 ML
S23	83/12/07 83/12/09 83/12/10	1 3 1	
S24	83/12/07 83/12/08 83/12/09	1 34 15	
S25	83/12/07 83/12/08 83/12/09 83/12/10	1 3 10 < 10	< 10
S26	83/12/07	14	
S27	83/12/07 83/12/08 83/12/09 83/12/10	20 > 80 2100 350	190 110
S28	83/12/07 83/12/08	19 92	
S29	83/12/08 83/12/09	670 120	
S30	83/12/09	2	
S31	83/12/09	> 8000	
S32	83/12/09 83/12/10 83/12/11	105 39 5	36 4

CONTINUED...

APPENDIX III (Continued)

STATION	DATE	FC/100 ML	FS/100 ML
S33	83/12/10	30	4
S34	83/12/10	46	10
S35	83/12/10 83/12/11	540 210	48
S36	83/12/11	140	150
S37	83/12/11	510	10
S38	83/12/11	600	99
S39	83/12/11	570	98
S40	83/12/11	3.3×10^5	3.1×10^6
S41	83/12/11	0	1
S42	83/12/11	0	0
S43	83/08/10	30	23

APPENDIX IV

SUMMARY OF BACTERIOLOGICAL RESULTS
FOR MARINE SAMPLE STATIONS

APPENDIX IV SUMMARY OF BACTERIOLOGICAL RESULTS FOR MARINE SAMPLE STATIONS - Sooke

SAMPLE STATION	AUGUST 9-14, 1983 (MPN/100 mL)				DECEMBER 6-12, 1983 (MPN/100mL)				ALL DATA (MPN/100 mL)			
	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile
1	11	< 2 - 5	< 2	< 2	4	< 2 - 13	-	-	15	< 2 - 13	< 2	9
2	11	< 2 - 33	< 2	23	6	< 2 - 49	5	24.4	17	< 2 - 49	< 2	26
3	11	< 2 - 9	2	7.4	6	< 2 - 23	6.5	17.6	17	< 2 - 23	2	10.5
4	11	< 2 - 5	< 2	3.6	4	2 - 8	-	-	15	< 2 - 8	< 2	6.5
5	10	< 2 - 2	< 2	2	7	< 2 - 17	2	17	17	< 2 - 17	< 2	14.2
5-depth	4	< 2 - 7	-	-	-	-	-	-	4	< 2 - 7	-	-
6	11	< 2 - 17	2	7.7	6	< 2 - 220	17	107	17	< 2 - 220	5	21.8
7	11	< 2 - 5	2	4.9	6	< 2 - 17	3.5	14.6	17	< 2 - 17	2	7.4
8	11	< 2 - 8	< 2	4.7	9	< 2 - 17	5	14.3	20	< 2 - 17	2	8
8-depth	4	< 2 - 4	-	-	5	< 2 - 2	< 2	< 2	9	< 2 - 7	< 2	5.2
9	11	< 2 - 33	< 2	3.8	9	2 - 49	11	34.6	20	< 2 - 49	2.5	33
9-depth	4	< 2 - 4	-	-	-	-	-	-	4	< 2 - 4	-	-
10	11	< 2 - 11	2	7.8	9	< 2 - 350	14	79.1	20	< 2 - 350	5.5	17
10-depth		-	-	-	5	< 2 - 7	< 2	4.5	5	< 2 - 7	< 2	4.5
11	11	< 2 - 17	2	7.7	9	2 - 240	8	95.1	20	< 2 - 240	5	33
12	11	< 2 - 33	5	6.8	9	5 - 70	17	48.4	20	< 2 - 70	7.5	46
12-depth	-	-	-	-	5	5 - 33	17	28	5	5 - 33	17	28
13	11	< 2 - 5	< 2	4.7	9	2 - 33	23	31.2	20	< 2 - 33	3.5	23
13-depth	-	-	-	-	5	< 2 - 4	< 2	3	5	< 2 - 4	< 2	3
14	11	< 2 - 8	< 2	2	6	2 - 13	6.5	11.8	17	< 2 - 13	2	8.9
15	6	< 2 - 11	< 2	4.4	5	2 - 130	7	76.5	11	< 2 - 130	2	21.8

CONTINUED...

APPENDIX IV (Continued)

SAMPLE STATION	AUGUST 9-14, 1983 (MPN/100 mL)				DECEMBER 6-12, 1983 (MPN/100mL)				ALL DATA (MPN/100 mL)			
	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile
16	6	< 2 - 11	< 2	4.4	5	5 - 8	5	6.5	11	< 2 - 11	5	7.7
17	6	< 2 - 5	< 2	3.2	5	< 2 - 33	7	20.5	11	< 2 - 33	2	7.9
18	6	< 2 - 17	9	13.4	8	< 2 - 11	7.5	8.6	14	< 2 - 17	7.5	11
19	6	< 2 - 13	< 2	7.6	8	< 2 - 33	3	13	14	< 2 - 33	2	11
20	6	< 2 - 23	3.5	12.2	8	2 - 13	6	9	14	< 2 - 23	5	11
21	6	< 2 - 2	< 2	< 2	5	< 2 - 33	2	23	11	< 2 - 33	< 2	11.9
22	6	< 2 - 2	< 2	< 2	4	4 - 17	-	-	10	< 2 - 17	< 2	5
23	6	< 2 - 33	5	18	4	< 2 - 23	-	-	10	< 2 - 33	5	23
24	6	< 2 - 33	< 2	13.4	5	< 2 - 5	< 2	2.5	11	< 2 - 33	< 2	4.5
25	6	< 2 - 33	5	27	5	< 2 - 11	5	8	11	< 2 - 33	5	21.8
26	6	< 2 - 33	< 2	16.2	5	2 - 5	2	5	11	< 2 - 33	2	5
27	6	< 2	< 2	< 2	5	< 2 - 23	5	15.5	11	< 2 - 23	< 2	7.7
28	6	< 2 - 8	< 2	6.2	5	< 2 - 5	2	3.5	11	< 2 - 8	< 2	5
29	5	< 2 - 2	< 2	< 2	5	2 - 5	2	3.5	10	< 2 - 5	2	2
30	6	< 2 - 33	12	33	5	< 2 - 17	13	17	11	< 2 - 33	13	31.4
31	6	< 2 - 33	< 2	27	5	5 - 33	11	23	11	< 2 - 33	7	32
32	6	< 2 - 2	< 2	< 2	3	< 2 - 8	-	-	9	< 2 - 8	< 2	2.6
32-depth	2	< 2	-	-	-	-	-	-	-	-	-	-
33	6	< 2 - 2	< 2	< 2	3	8 - 33	-	-	9	< 2 - 33	< 2	24
33-depth	2	< 2	-	-	-	- -	-	-	-	-	-	-
34	3	< 2 - 5	< 2	3.5	6	2 - 46	27.5	38.2	9	< 2 - 46	5	34.3
35	3	< 2 - 8	-	-	9	< 2 - 27	5	15.3	12	< 2 - 27	5	12.8

CONTINUED...

APPENDIX IV (Continued)

SAMPLE STATION	AUGUST 9-14, 1983 (MPN/100 mL)				DECEMBER 6-12, 1983 (MPN/100mL)				ALL DATA (MPN/100 mL)			
	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile	No. of Samples	Range	Median	90 Percentile
36	-	-	-	-	4	5 - 33	-	-	4	5 - 33	-	-
37	-	-	-	-	6	5 - 170	10.5	81.8	6	5 - 170	10.5	81.8
38	-	-	-	-	7	< 2 - 49	13	26.6	7	< 2 - 49	13	26.6
39	-	-	-	-	6	< 2 - 49	9	39.4	6	< 2 - 49	9	39.4
40	-	-	-	-	7	2 - 33	17	26	7	2 - 33	17	26
41	-	-	-	-	7	2 - 79	13	58	7	2 - 79	13	58
42	-	-	-	-	5	< 2 - 11	7	9	5	< 2 - 11	7	9
43	-	-	-	-	6	< 2 - 23	16.5	22.4	6	< 2 - 23	16.5	22.4
44	-	-	-	-	6	5 - 79	15	44.8	6	5 - 79	15	44.8
45	-	-	-	-	6	4 - 70	18	57.4	6	4 - 70	18	57.4
46	-	-	-	-	3	13 - 49	-	-	3	13 - 49	-	-
47	-	-	-	-	3	8 - 33	-	-	3	8 - 33	-	-
47-depth	-	-	-	-	3	2 - 17	-	-	3	2 - 17	-	-
48	-	-	-	-	3	8 - 23	-	-	3	8 - 23	-	-
49	-	-	-	-	3	17 - 79	-	-	3	17 - 79	-	-
50	-	-	-	-	3	5 - 8	-	-	3	5 - 8	-	-
50-depth	-	-	-	-	3	< 2 - < 2	-	-	2	< 2 - < 2	-	-
51	-	-	-	-	2	2 - 13	-	-	2	2 - 13	-	-

APPENDIX V

SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER STATIONS

APPENDIX V SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER SAMPLE STATIONS
SOOKE HARBOUR AND BASIN AUGUST 9-14, 1983

SAMPLE STATION	FECAL COLIFORM/100 ML			FECAL STREPTOCOCCI/100 ML			MEAN FC:FS RATIO
	No. of Samples	Range	Mean	No. of Samples	Range	Mean	
S1	3	38 - 260	116	3	60 - 300	157	0.74
S2	3	< 10 - 19	14	3	10 - 18	16	
S3	3	30 - 40	36	3	5 - 10	8	
S4	3	220 - 290	253	3	200 - 300	243	1.04
S5	3	130 - 470	343	3	390 - 810	580	0.59
S6	3	1 - 40	22	3	27 - 50	36	
S43	1	30		1	23		

APPENDIX V SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER SAMPLE STATIONS
SOOKE HARBOUR AND BASIN DECEMBER 6-12, 1983

SAMPLE STATION	FECAL COLIFORM/100 ML			FECAL STREPTOCOCCI/100 ML			MEAN FC:FS RATIO
	No. of Samples	Range	Mean	No. of Samples	Range	Mean	
S1	5	24 - 2900	697	2	100 - 230	115	6.06
S2	4	17 - 733	238	1	< 10		
S3	1	13					
S4	3	16 - 61	33	2	3 - 28	16	
S5	3	1 - 8		1	40		
S6	4	4 - 30	17				
S7	1	0					
S8							
S9							
S10	1	4		1	< 10		
S11	3	10 - 16	14				
S12	1	26					
S13	1	0					
S14	3	7 - 14		1	2		
S15	1	3					
S16	4	1 - 19		1	1		
S17	5	3 - 64					
S18	5	1 - 10					
S19	5	0 - 1					
S20	3	10 - 44					
S21	3	1 - 18					
S22	3	3 - 11					

CONTINUED...

APPENDIX V SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER SAMPLE STATIONS SOOKE HARBOUR AND BASIN DECEMBER 6-12, 1983

SAMPLE STATION	FECAL COLIFORM/100 ML			FECAL STREPTOCOCCI/100 ML			MEAN FC:FS RATIO
	No. of Samples	Range	Mean	No. of Samples	Range	Mean	
S23	3	1 - 3					
S24	3	1 - 34	17				
S25	4	1 - 10	5	1	> 10		
S26	1	14					
S27	4	20 - 2100	823	2	110 - 190	150	5.48
S28	2	19 - 92	55				
S29	2	120 - 670	395	1			
S30	1	2					
S31	1	> 8000					
S32	3	5 - 105	65	1	4 - 36	20	
S33	1	30		1	4		
S34	1	46		1	10		
S35	2	210 - 540	375	1	48		
S36	1	140		1	150		0.9
S37	1	510		1	10		
S38	1	600		1	99		6.0
S39	1	570		1	98		5.8
S40	1	3.3×10^5		1	3.1×10^6		0.1
S41	1	0		1	1		
S42	1	0		1	0		

APPENDIX VI

SUMMARY OF BACTERIOLOGICAL RESULTS
FOR SHELLSTOCK AND SEDIMENT

APPENDIX VI SHELLSTOCK SUMMARY - Sooke Survey, August 9-14, 1983

DATE SAMPLED	DATE INSPECTED	LOCATION	SPC/g	FC MPN/100g	SPECIES
Aug. 9	Aug. 9	Roche Cove (SS26)	320	20	Manila
Aug. 9	Aug. 9	Hutchinson Cove (SS30)	350	270	Mixed LN
Aug. 9	Aug. 9	Anderson Cove (SS20)	170	40	Oysters
Aug. 9	Aug. 9	Cooper Cove	650	2200	Manila
Aug. 9	Aug. 9	Sooke Flats (SS11)	950	110	Mixed clams
Aug. 10	--	Anderson Cove (SS18)	380	460	Mixed LN
Aug. 10	--	SS6	680	20	Butter clams
Aug. 10	--	Anderson Cove - entrance	280	50	Mixed LN
Aug. 10	--	Roche Cove (SS26)	1400	5400	Mixed LN
Aug. 10	--	Anderson Cove (SS20)	140	330	Oysters
Aug. 10	--	Eliza Point	200	110	Native LN
Aug. 11	--	SS17	--	50	Butter clams
Aug. 11	--	Anderson Cove (SS18)	--	110	Mixed LN
Aug. 11	--	Hutchinson Cove (SS31)	--	1300	Mixed LN
Aug. 11	--	Sooke Flats (SS11)	--	490	Butter clams
Aug. 11	--	Eliza Point	--	3500	Native LN
Aug. 11	--	Billings Spit	--	130	Mixed LN

APPENDIX VI **MARINE SEDIMENT SUMMARY - Sooke Survey, August 9-14, 1983**

1/SEDIMENT STATION	DATE SAMPLED	TC MPN/100 g	FC MPN/100 g	SPC /1 g
2	83/08/09	2400	< 20	800
2	83/08/10	2400	110	4.8×10^3
6	83/08/10	2400	40	4.3×10^3
11	83/08/09	1100	< 20	4.0×10^2
17	83/08/12	330	< 20	1.1×10^3
18	83/08/10	2400	1300	1.6×10^4
20	83/08/09	16000	NC	9.2×10^4
20	83/08/11	1110	70	9.2×10^3
23	83/08/12	490	20	2.2×10^3
24	83/08/09	2400	< 20	7.1×10^3
24	83/08/12	1700	110	1.6×10^4
26	83/08/09	5400	20	2.5×10^4
26	83/08/12	220	80	3.1×10^3
31	83/08/09	1700	40	1.2×10^3
31	83/08/11	230	50	1.4×10^3
31	83/08/12	2400	70	4.7×10^3
Coopers Cove	83/08/09	1800	< 20	6.6×10^4
Coopers Cove	83/08/12	9200	110	9.2×10^3
Eliza Point	83/08/10	NC	50	2.6×10^3
Eliza Point	83/08/11	5400	2200	3.7×10^3
Whiffin Spit	83/08/09	20	< 20	2.5×10^6

N.C. - No Count

1/Sediment station numbers correspond to marine station numbers.

APPENDIX VII

BIOCHEMICAL CONFIRMATION RESULTS

APPENDIX VII **MPN ISOLATE BIOCHEMICAL SUMMARY**
Sooke Survey, August 9-14, 1983

STATION SAMPLED	NO. OF SAMPLES	NO. OF POSITIVE *E. Coli*	PERCENT POSITIVE
2	6	6	100
10	6	5	83 (K. oxygtoca)
17	5	5	100
21	11	11	100
25	5	5	100
33	6	5	83
TOTAL	39	37	94

APPENDIX VIII **SEDIMENT ISOLATE BIOCHEMICAL SUMMARY**
Sooke Survey, August 9-14, 1983

STATION SAMPLED	NO. OF SAMPLES	NO. OF POSITIVE *E. Coli*	PERCENT POSITIVE
2	4	4	100
16	9	9	100
Eliza Pt.	11	11	100
TOTAL	24	24	100